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AUTHOR Tomblin, Elizabeth A.; And Others
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ABSTRACT

The San Diego Board of Education requested that pilot programs be conducted with commercially developed (Grades K-8) mathematics textbooks and programs in order to determine which of the programs/texts were superior, and whether a district-developed program could successfully compete with commercially produced materials. The pilot program evaluation study was designed to cover the school years 1983-84 and 1984-85. The results of the 1983-84 school year evaluation study are contained in this document. Quantitative and qualitative analyses were conducted in the areas of student achievement, cost effectiveness, staff opinion, program implementation, and weighted results. The appendices include: (1) Composition of Student Sample; (2) Student Achievement Level Performance on Total Math by Publishers; (3) Student Achievement Score Conversions, (4) Computation of Duplicating Costs; (5) Approved List of Pilot Program Materials; (6) Classroom Observation Forms; (7) Staff Survey Instrument; (8) Staff Responses to Inservice and Support Services Questions; and (9) Program Comparisons of All Factors Based on Equal Weightings. It was recommended that the results be used to refine the in progress second year study, and that Board of Education use those results to decide on new program adoptions. (DWH)

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San Diego City Schools

EVALUATION DEPARTMENT REPORT

ED256783

FIRST YEAR EVALUATION OF THE MATHEMATICS PILOT PROGRAMS GRADES K-8

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No. 381

October 23, 1984

PLANNING, RESEARCH AND EVALUATION DIVISION

TM 850 240

FIRST YEAR EVALUATION OF THE MATHEMATICS PILOT PROGRAM GRADES K-8

Prepared by

Dr. Elizabeth A. Tomblin
Dr. Stephen W. Isaac
Dr. J. Richard Harsh
Janet E. Hintzman

October 23, 1984

Integration and District Programs Unit
Elizabeth A. Tomblin, Ph.D.
Associate Director
Evaluation Department
Stephen Isaac, Ph.D.
Director
Planning, Research, and Evaluation Division
Dean H. Nafziger, Ph.D.
Assistant to the Superintendent

Acknowledgments

Acknowledgments for staff contributions listed in alphabetical order:

Connie Busse
Stuart Macnofsky
Robert Raines
Daryl Stermon
Sharon D. Whitehurst

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EXEC IVE SUMMARY

First Year Evaluation
of the
Mathematics Pilot Programs
Grades K-8
October 23, 1984

EXECUTIVE SUMMARY

I. Issue/Concern

The Board of Education requested that pilot programs be conducted with four different mathematics textbooks at grades K-6 and with three such programs/texts at grades 7-8 in order to determine (1) which of the programs/texts were superior and (2) whether a district-developed program can compete successfully with commercially produced textbooks. To investigate these questions, quantitative and qualitative analyses were conducted in five areas: (1) Student Achievement, (2) Cost-Effectiveness (3) Staff Opinion, (4) Program Implementation and (5) Weighted Results.

II. Background

On April 12, 1983, the Board of Education requested the Evaluation Department to undertake a comparative evaluation of the District's mathematics textbook options, grades K-8. The four publishers for grades K-6 were Addison-Wesley, the District, Heath, and Scott Foresman. The three publishers for grades 7-8 were the District, McGraw-Hill, and Scott Foresman.

A K-8 study was designed focusing on achievement outcomes on the Comprehensive Tests of Basic Skills (CTBS) in three representative grades: 3, 6 and 8; cost-effectiveness; attitudes of staff; and program implementation. The study was designed to cover the school years 1983-84 and 1984-85. This document contains the results for 1983-84.

III. Discussion

A. Student Achievement

Results were measured by three CTBS math scores (Computation, Concepts and Applications, and Total Math) at grades 3, 6 and 8. Four levels of student achievement were considered: high, middle, low and all students. Analysis compared results from the use of the four publishers in grades 3 and 6 and the three publishers in grade 8. The analysis of covariance statistical technique was used to adjust for any pretest differences which may have existed between students' achievement.

Statistically significant results indicate an overall trend favoring Heath's instructional materials in grade 3 and the District's

materials in grade 6. The modest trend that exists in grade 8 also favors the District. With one exception, the consistency of these trends held true for all three achievement levels, wherever statistical significance was found (19 out of 36 comparisons). In grade 3, where only high and middle achievers reached significance (7 out of 12 comparisons), both did their best with Heath. In grade 6, high, middle and low achievers reaching significance all did their best with the District materials (9 out of 12 comparisons), with the exception of Math Computation, where high achievers scored best with Scott Foresman. The only two statistically significant findings for grade 8 also favor the District. When students of all three grade levels were taken together--i.e., students of all achievement levels were viewed collectively--the same consistent relationships were found, especially in grades 3 and 6.

B. Cost-Effectiveness

Cost of student materials are based on one set of materials per student prorated over a six-year adoption cycle form the basis of the cost analysis. Costs are greatest at third grade because all student materials are consumable and must be replaced each year. Personnel and facilities costs were not included in the calculations because they are not specific to individual programs.

The District program is the least expensive at all three grade levels studied (3, 6 and 8). At third grade, program costs range from $6.44 per student to $8.92 per student. At sixth grade the costs per student range from $3.41 to $5.02. At grade 8, the range is $2.93 to $5.03.

Combining costs per student with adjusted-mean-scale-score gain, the cost-per-scale-score gain ranges from $.15 for the District program at grade 3 to $.24 per student for Addison-Wesley. At grade 6, the cost-effectiveness ratio ranges from $.13 for the District program to $.26 for Addison-Wesley. At grade 8, the District program is $.24 cost-per-scale-score gain, McGraw-Hill is $.35 and Scott Foresman costs $.56.

C. Staff Opinion

Staff opinion reflects the survey responses of teachers and administrators about the program they were piloting and was favorable for all of the programs. There were some criticisms and disadvantages stated for every program, but the predominant response to each program was positive and supportive. Every program was considered to be at least adequate or better for the students.

Depending on which question or which grade level one examines, the responses as to the "best" program differ. For the differences and comments, the interested reader should examine the tables and Part Four of the report. Only summary information is given here.

Elementary staff in K-6 gave the highest recommendation for adoption to Addison-Wesley and D. C. Heath programs. The District program was

third, and Scott Foresman received the lowest recommendation for adoption in the elementary schools. Junior high school staff recommended the District program most highly and gave it the highest rating for providing the full range of instruction. If the median on specific selected questions is used as an indicator, as it was in the weighting section, the order of grades K-3 programs ranked by staff is: (1) Addison-Wesley, (2) District, and a tie for third between Heath and Scott Foresman. The grades 4-6 programs ranked by median also produced a tie, with the District program receiving the highest rating, Heath and Scott Foresman tied for second, and Addison-Wesley ranked fourth.

D. Observation of the Implementation of the Programs

All schools understood and supported the design of the pilot study, according to observers. Each program, district and commercial, was the basic material of instruction in the pilot schools. All commercial programs and the District program received positive support from the majority of users. All programs also had some teachers who believed the program had faults or undesirable characteristics.

Observation of instruction presented in the classrooms using the commercial programs provided evidence that there was much more variation of the use of materials from classroom to classroom than there was among classes using the District program. Some teachers piloting the commercial programs perceived the inservice suggestions as so permissive that the materials were seen as options rather than important components to use with heterogeneous student populations. Of the commercial programs, teachers using Addison-Wesley and Scott Foresman reflected the highest enthusiasm for the content, organization, and illustrations of the textbooks. The District program was perceived differently from the commercial programs. Most teachers perceived that the District program had an explicit design with recommended materials, activities, sequence, and pacing to be used. Thus, it may be concluded that the District program presents a specific design sequence and pacing of instruction while the commercial programs primarily present materials that were variously used or unused.

In summary, the commercial materials were commonly seen by the pilot teachers as an array for the teachers to use and orchestrate in their own design. By contrast, the District program was seen as a prescribed sequence of activities, materials, time, and assessments that were to be followed by all teachers.

IV. Conclusions - Program Results by Weighted Attributes

Since there were many factors measured in the evaluation, a method was needed to combine the results into a weighted summary. Using an established statistical procedure, the Board of Education ranked the attributes being measured, and value weights were assigned to each attribute. The value weights were multiplied by the outcomes on each attribute to yield an overall weighted sum for each program. Attributes listed in order of importance with their weights were:

Rank	Attribute	Weight
1.	Student achievement results in Concepts and Applications (problem solving).	.222
2.	Student achievement in Computation.	.194
3.	Achievement of students designated as middle-achieving (those in the middle two quarters by percentile scores).	.167
4.5	(Tied rank for fourth and fifth.) Achievement of low-achieving and high-achieving students.	.125
6.	Cost per scale score gain.	.083
7.	Staff opinion.	.056
8.	Program of least cost.	.028

The programs in their order of weighted rank (most points to least) are:

Grade 3: (1) Heath, (2) District, (3) Scott Foresman, (4) Addison-Wesley.

Grade 6: (1) District, (2) Scott Foresman (3) Addison-Wesley, (4) Heath.

Combined K-6: (1) District, (2) Scott Foresman, (3) Heath, (4) Addison-Wesley.

Grade 8: (1) District, (2) McGraw-Hill, (3) Scott Foresman

All programs showed progress in student achievement, received positive support from staff, and were relatively cost effective. Therefore, all programs could be considered adequate for providing a good quality mathematics program.

V. Recommendation

It is recommended that the Board of Education use results of the second year report rather than take action on the basis of this report and allow staff to use these data as a basis for refining the second year study now in progress. The Board has determined to defer adoption of new program(s) until 1986 for 1987-88 implementation to synchronize with state adoption. Results of this report may be used for decisions regarding replacement of worn-out old matrix materials until that time.

VI. Budget Implication

The continued piloting and evaluation of the mathematics programs already has been accounted for in the 1984-85 budget. Implications for the adoption of a mathematics program for the district would occur in the year the adoption takes place.

PART ONE

INTRODUCTION

PART ONE
INTRODUCTION

A. Background

The Board of Education requested that pilot programs be conducted with four different mathematics textbooks at grades K-6 and with three mathematics textbooks at grades 7-8 in order to determine (1) which of the texts were superior and (2) whether a district-developed program can compete successfully with commercially produced textbooks.

The Evaluation Department was asked to design and implement an evaluation of these programs to provide the Board of Education with information for decisions regarding mathematics programs in the district. The pilot programs are being conducted for two years, 1983-84 and 1984-85, with evaluations carried out for each year. To compare the programs, the evaluation investigates student achievement, cost-effectiveness, staff opinions, implementation of the pilot programs and combines the results in a weighted summary.

The four programs for grades K-6 are:

Addison-Wesley (1981 Edition)
District (1983 Edition)
D. C. Heath (1981 Edition)
Scott, Foresman and Company (1980 Edition)

The three programs for grades 7-8 are:

District (1983 Edition)
McGraw-Hill (1981 Edition)
Scott, Foresman and Company (1980 Edition)

Throughout the report, results are shown by programs listed in alphabetical order except in conclusions or where noted as ranked.

B. Sample of Schools and Grades

To keep the data analysis within manageable limits and at the same time focusing on representative grades, the decision was made to examine test results at three grade levels: 3, 6 and 8. While this eliminated data for the other grades, it did provide results for three critical points: end of primary, end of upper elementary, and mid-junior high just prior to the freshman year.

From a listing of all schools in the district, a list of schools was compiled from those operating on a traditional year schedule and testing students using the CTBS at grades 2, 5, and 7. This procedure assured that all participating schools would have all necessary pretest scores available for followup posttesting in grades 3, 6, and 8. These schools were then surveyed by the Educational Services Division to determine which of the proposed textbooks were of interest to them for piloting. Each school indicated its first three priorities in rank order.

Using districtwide test results from the preceding year, the schools were divided into three categories or strata: low achieving, middle achieving, and high achieving--to maintain a balance among the pilot schools. From the resulting list, a stratified random drawing to select the schools was held publicly, with a kindergarten student drawing school names and a member of the Board of Education witnessing and certifying the drawing. Nearly all schools received their first choice, and only a few were drawn for their second choice.

The schools piloting each of the programs are as follows:

GRADES K-6

Addison-Wesley	District	Heath	Scott Foresman
Chesterton	Bayview Terrace	Crown Point	Bay Park
Hickman	Benchley-Weinberger	Ericson	Boone
Jefferson	Cabrillo	Fletcher	Cubberley
Pacific Beach	Doyle	Juarez	Franklin
Sandburg	Florence	Oak Park	Green
Silver Gate	Penn	Toler	Loma Portal
	Spreckels		
	Walker		

GRADES 7-8

Scott Foresman	District	McGraw-Hill
Marston	Roosevelt	Mann
	Bell	

C. Design Overview

The evaluation design included four principal components:

Student Achievement (CTBS Results)
Cost-Effectiveness
User Opinion (Teachers and Administrators)
Classroom Observation of Program Implementation

The components are aggregated by a weighted ranking. The design features will be presented and results discussed separately for each of these four components in their respective sections. Following is a brief paragraph about each of the four components, plus a brief description of the weighting system. It is noteworthy that the design of this study includes both quantitative and qualitative analyses. This gives a more comprehensive understanding of the results than could be obtained by either alone.

Student achievement was measured across three grade levels (3, 6 and 8) using scores from the Comprehensive Tests of Basic Skills (CTBS) in Math Computation, Math Concepts and Applications and Total Math. Four levels of student achievement were analyzed (high, middle, low and all students). Results were compared across the four publishers in grades 3 and 6 and three publishers in grade 8 using the statistical technique of analysis of covariance to adjust for differences in pretest scores.

Cost-effectiveness of the textbooks was determined by first conducting a cost analysis of each of the programs, then comparing these figures with the effectiveness by test scores.

The opinions of the teachers and administrators using the textbooks and programs were collected by a survey conducted in the spring of 1984, after they had used the programs for almost a year.

A fourth part of the evaluation was observation of implementation, conducted to determine that the programs and texts to be piloted were indeed used in the classrooms at the pilot schools. Observations were made at three different times during the year for this purpose. Visits were unannounced, although teachers were informed that observers would be coming at some points during the pilot.

D. Ranked Importance of Components and Weighted Results

In order to condense the multiple methods and findings of this comprehensive design into a meaningful summary and present data to the decision-makers in a useful manner, the Board of Education ranked the components of the design in order of importance. This ranking was done in the fall of 1983, prior to any data collection. Based on this ranking, a weighting was then assigned to each component. Results are multiplied by the weighting to yield a weighted score for each program at grades 3, 6 and 8.

PART TWO

STUDENT ACHIEVEMENT

PART TWO
STUDENT ACHIEVEMENT

I.
DISCUSSION OF TECHNICAL TERMS

In the discussion of student achievement and the analysis of results in the section that follows, it is important to define student achievement and five technical terms: (1) scale scores, (2) ceiling effects, (3) regression effects, (4) statistical significance, and (5) analysis of covariance (ANCOVA).

A. Student Achievement

For purposes of this study, student achievement is defined as the scale score each student obtained on the Mathematics Subtests of the Comprehensive Tests of Basic Skills, Form U: Computation, Concepts and Applications and Total Math. All students in the study had matched pretest-posttest scores with the pretest obtained in the spring of 1983 in grades 2, 5 and 7, and the posttest obtained in the spring of 1984 in grades 3, 6 and 8.

B. Scale Scores

When a student at a given grade level takes the Comprehensive Tests of Basic Skills (CTBS), he or she receives a series of raw scores--the number of items correct on a given subtest. Raw scores, by themselves, have little meaning until they are converted to a relative scale, such as percentiles, grade equivalents or scale scores. Furthermore, raw scores themselves are not comparable from one subtest to another (e.g., reading comprehension and math computation) or, within the same subtest, from one grade level to another.

The most appropriate unit of analysis for the comparison of the relative achievement of students on different subtests and across different grade levels is the scale score. Derived from the student's raw score, it is based on a statistically equated distribution of scores that allows the foregoing comparisons. It also allows the more powerful analyses of the data involving means and standard deviations, such as the analysis of covariance used in this study.

C. Ceiling Effects

A norm-referenced test is designed to assess the relative achievement of students, one compared to another, across a sample of test items representing a defined content area of achievement. A typical score from such a test is the student's percentile rank. A percentile rank of 99 means that the student did as well as, or better than, 99 percent of the students in the norm group. It does not indicate, however, how much of the content area the student has actually mastered, as is true for a criterion-referenced test.

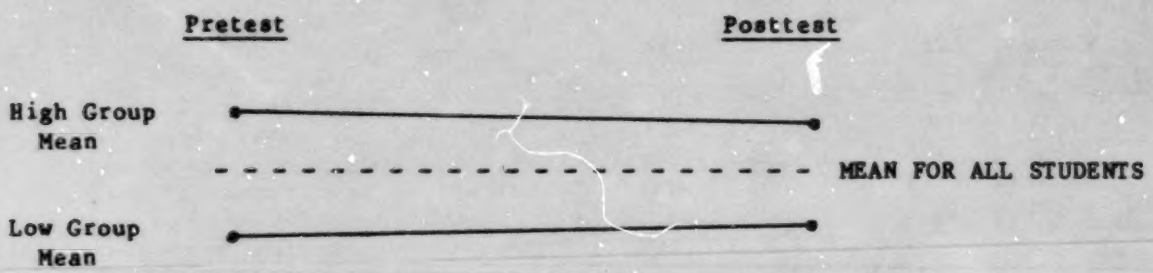
When the top quarter of a group of students is identified, and if it turns out that they all are answering most of the questions correctly, this results in a "ceiling effect." In other words, the students are bumping up against the top of the test, or maximum score, and the test is no longer

able to assess how much more one student knows than another. As a result, their chances of showing growth on the posttest are diminished or nullified.

Such an effect will be shown to be a principal factor in the third-grade results for the top group where differences between the pretest and posttest approach zero. Since a rival explanation is that the curriculum did not address the needs of high-achieving students, it is important to closely examine the case for a ceiling effect.

D. Regression Effects

Other things being equal, there is a tendency for extreme scores (high or low) on a pretest to move back closer to the mean (or average) on a posttest. The result is that a group of high scores on the pretest tend to decrease on the posttest and a group of low scores, by the same principle, tend to increase on the same posttest. This phenomenon, called "regression to the mean," graphically would look something like this:



The reason for this, where test scores are concerned, lies mostly in the fact that every score contains a certain amount of "measurement error"--commonly known as lucky or unlucky guesses. The two sets of students that made up the high and low groups on the pretest, scored as they did mostly because of their true achievement, or lack of it. But part of their high or low score was due to a higher than normal amount of lucky or unlucky guessing, respectively.

On the posttest, these same students tend to approach more normal results for guessing, and their scores move back toward the norm, as the graph illustrates.

E. Statistical Significance

The basic unit of comparison in this study is the mean, or average, scale score for each of several comparison groups on pretests and posttests. It turns out that whenever means are computed for two or more groups of students on an achievement test, differences are inevitable. The important question is, How large must these differences be in any given case to be considered not due to chance? Statisticians have established both methodologies and conventional standards for the probability of a given difference to be attributable to chance or not. That conventional standard

in the field of behavioral research is the .05 level of significance. A significance level at or below .05 tells us that in a hundred occurrences the difference in scores would occur by chance only five times.

This convention is quite conservative and demanding of the data, where the establishment of new knowledge is at stake. Obviously, the practical world of decision-making often makes judgments on a more liberal basis where the risks of being wrong are more generous but the odds of being correct are still in one's favor. Nevertheless, to be fair to all programs, and to realistically recognize that most differences are chance fluctuations, this analysis will follow the conservative convention of requiring the probability of a chance explanation to occur no more than five out of a hundred times.

F. Analysis of Covariance (ANCOVA)

Ideally, in comparing the performance of different groups of students during a school year, they should begin at a common level of achievement--i.e., equal pretest scores. However, the manner in which it was practical to select the schools for the math pilot study did not necessarily prevent differences among the several groups of students on the pretest.

A simple but inappropriate solution would be to rely on gain scores--the difference between the pretest and the posttest. Thus, if one group starts off with a higher pretest score than another, it must end with about the same amount of growth on the posttest just to keep even. Logically then, if the low-scoring group closes the gap, it will have a larger gain score than its rival and might be judged to have benefited from a more effective instructional program. What makes this conclusion inappropriate is the fact that part of the larger gain score might have resulted from regression to the mean--a statistical phenomenon discussed previously that tends to artificially decrease scores above the mean or increase scores below the mean.*

An appropriate and standard method for adjusting for differences on the pretest--in effect, setting all mean scores equal to each other--is called analysis of covariance. In essence, this technique compensates for these initial differences by equating the pretest means and controlling the effects of regression. Based on the adjusted pretest mean scores, adjusted posttest scores are generated as well, as a measure of the statistical significance of differences observed between groups. The determination of statistical significance is important to distinguish whether a result is due to something other than chance.

*See "Regression Effects."

II.
STUDENTS IN PILOT PROGRAM

The pilot program included 2,947 students for whom both pre- and posttests were available. The third grade sample was 1,134 students of whom 12% were low achieving, 39% were middle achieving, and 49% were high achieving. The composition of the sixth grade sample of 1,343 students was 12% low achieving, 51% middle achieving and 37% high achieving. Of the 470 students in the eighth-grade sample, 19% were low achieving, 71% were middle achieving, and 9% were high achieving.

As these percentages indicate, the elementary students were not distributed on a normal curve; the pilot population has fewer low-achieving and more high-achieving students than would normally be found. However, these percentages do approximate districtwide testing results for student math achievement which show 11.7% low achieving, 45.1% middle achieving, and 43.2% high achieving. The policy of putting high-achieving students into algebra classes would explain the low percentage of these students in the pilot eighth-grade basic math classes.

III.
STUDENT ACHIEVEMENT RESULTS

A. Method

As discussed in the previous section under analysis of covariance, the simplest technique for measuring change between a pretest and a posttest is to subtract the former from the latter and report the difference as the amount gained or the gain score. Because pretest scores often differ and because of the unequal effects of regression to the mean, the appropriate statistical solution is to employ analysis of covariance.*

This technique was applied to the achievement test scores pretests and posttests as they ranged across the following variables:

1. Publisher's Text
2. Achievement Test Scores (CTBS)
   a. Total Math
   b. Math Computation Subtest
   c. Math Concepts and Applications Subtest

*For a graphic portrayal of the difference between raw score means, unadjusted scale score means and covariance adjusted scale score means, see Appendix C.

3. Student Achievement Level

   a. High (students in the top 25 percent of the publisher's norm group)

   b. Middle (students in the middle 50 percent of the publisher's norm group)

   c. Low (students in the bottom 25 percent of the publisher's norm group)

Figures 1 through 13 show achievement posttest results for grades 3, 6 and 8 in scale scores of the Comprehensive Tests of Basic Skills, Form U. Pretests were administered in spring, 1983, and posttests in spring, 1984, with the following levels given to each grade level:

PRETEST Spring, 1983	POSTTEST Spring, 1984
Grade 2 (Level D)	Grade 3 (Level E)
Grade 5 (Level G)	Grade 6 (Level G)
Grade 7 (Level H)	Grade 8 (Level H)

The average scale score for students on pre- and posttests is shown in graph and chart form. The means have been adjusted by the analysis of covariance (ANCOVA) procedure. The chart includes a statement indicating whether or not statistical significance was found and at what level.

As noted in the previous section discussing statistical significance, p=.05 is the conventional level before recognizing a difference as significant. It follows, therefore, that levels below p=.05 are even more significant. In the tables under discussion there are numerous instances when p=.000. This tells the reader that the difference is highly significant--less than one in a thousand chances that such a result could happen by chance.

To help the reader discern between results that are, or are not, statistically significant, a shading device is used. Graphs depicting no statistically significant differences are shaded gray. Those displaying differences that are statistically significant appear as the usual black print against a white background. A finding of statistical significance indicates that values as large or larger than the observed differences seldom occur by chance. Significance in the group differences as a whole does not insure significance between every single pair of program means. There is certainly a difference between the highest and lowest programs. If no statistical significance has been found, it is so noted underneath the chart indicating that the program differences are within a chance range. In other words, the programs are considered to have essentially made similar gains. The charts shown beside each graph give the numbers of students taking the tests, the pretest means and the posttest means adjusted, as in the graphs, by the analysis of covariance procedure.

When the ANCOVA is performed, the pretest scores in a given set of comparisons are mathematically equated and an adjusted posttest score is predicted. The statement of significance is indicated for the adjusted mean after analysis of covariance has been performed. The means shown in the chart are those which are the result of the analysis of covariance and are adjusted to represent a clearer and more accurate picture of the differences between programs.

B. Results

1. Total Math Test Scores

Figure 1 shows results for Total Math scores at grades 3, 6, and 8. Total Math is a combination of the Math Computation and Math Concepts/Applications subtests. Differences between programs are significant at grade 3 and grade 6, but not significant at grade 8.

2. Computation and Concepts/Applications

Figures 2, 3 and 4 show the Total Math and both subtests for grades 3, 6, and 8 respectively. At grade 3, program differences are significant for the Computation and Concepts/Applications Subtests. At grade 6, differences are significant for the Computation and Concepts/Applications Subtests. At grade 8, differences are not significant for Total Math and the Computation Subtest, but are significant for the Concepts/Applications Subtest.

3. Results by High-, Middle- and Low-Achieving Students

Figures 5 through 13 show comparisons of the four programs by student achievement levels. High-performing students are those whose pretest scores were above the third quartile or above the 75th percentile. Middle-achieving students were those who scored between the 25th and 75th percentile on the posttest. Low-achieving students were those whose pretest scores were below the 25th percentile.

4. Total Math Scores Results by Achievement Levels

For grade 3 (Figure 5), Total Math differences were significant for the high-achieving students, but not for the middle- and low-achieving students. For grade 6, differences were significant for high- and middle-achieving students, but not for low-achieving students. At grade 8, differences were not significant for high-, middle-, or low-achieving students, meaning that the achievement gains were essentially the same for all programs for all three levels of achievement.

5. Computation Subtest Results by Achievement Levels

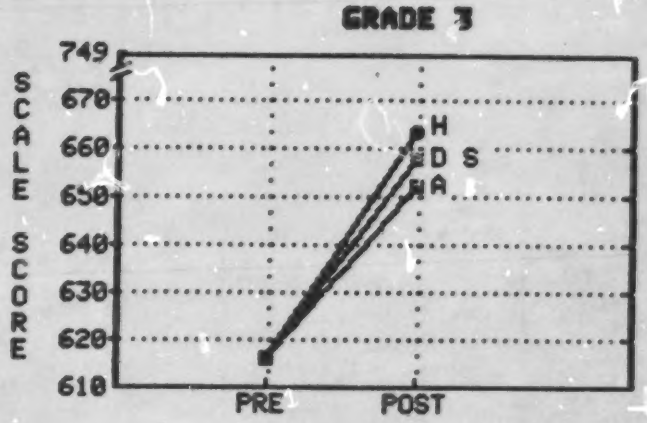
At grade 3 (Figure 8), on the Computation Subtest, differences were significant only for the high-achieving students and not for the middle- or low-achieving students. At grade 6 (Figure 9), differences were significant for high-, middle- and low-achieving students. Grade 8 results did not show significance for any of the three achievement levels on the Computation Subtest (Figure 10).

TOTAL MATH*

ALL GRADE LEVELS

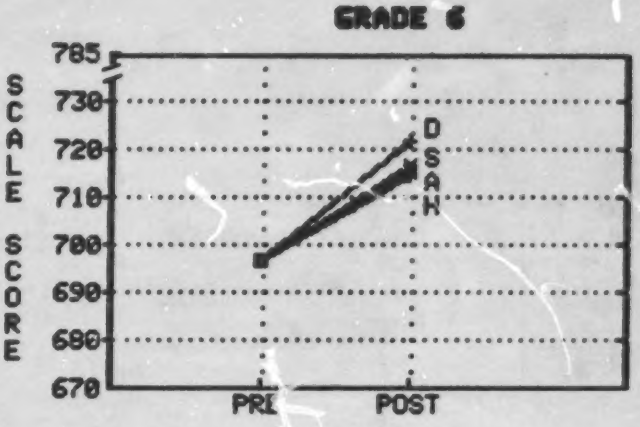
	A-W N= 304	D N=357	H N=272	S-F N= 201
PRE	616.13	616.13	616.13	616.13
POST	652.46	657.91	663.52	657.88
GAIN	36.33	41.78	47.39	41.75

Differences significant (p=.000)



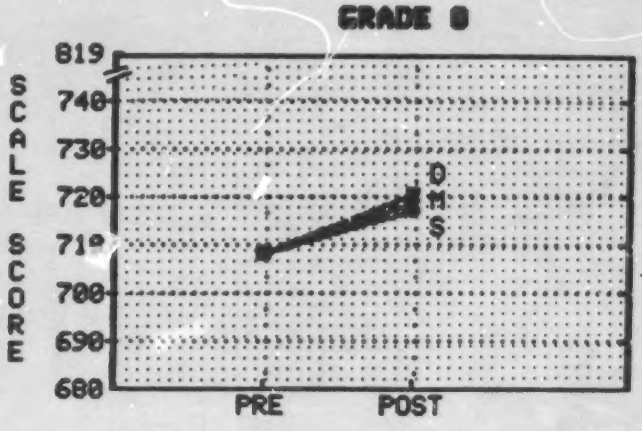
	A-W N= 410	D N=353	H N=322	S-F N=258
PRE	696.44	696.44	696.44	696.44
POST	715.60	721.90	714.31	716.99
GAIN	19.16	25.46	17.87	20.55

Differences significant (p=.000)



	D N= 204	H N= 136	S N=130
PRE	708.42	708.42	708.42
POST	720.40	718.86	717.50
GAIN	11.98	10.44	9.08

Differences not significant (p=.057)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
M = MC GRAW HILL
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 1

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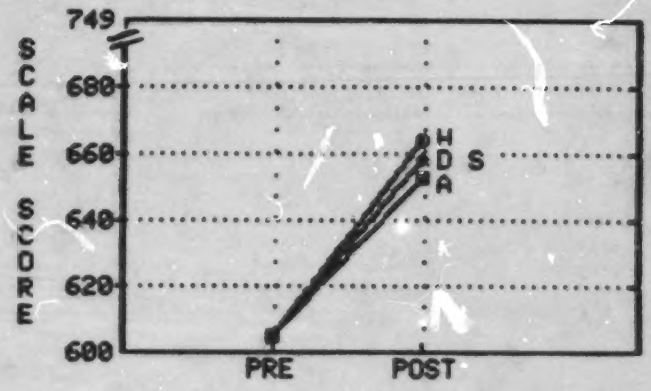
PROGRAM COMPARISONS

TOTAL MATH AND SUBTESTS*

GRADE 3

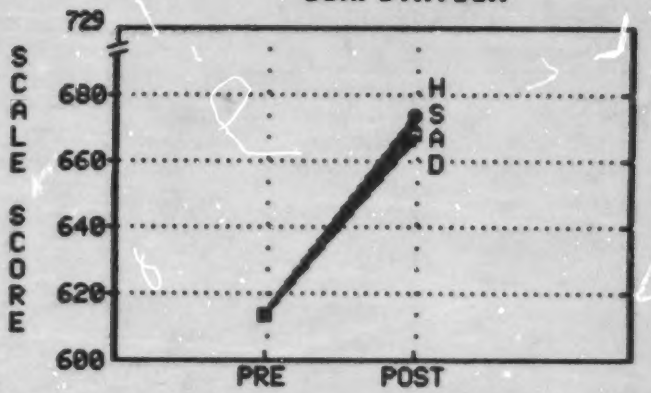
	A-W N= 304	D N= 358	H N=272	S-F N=201
PRE	616.13	616.13	616.13	616.13
POST	652.46	657.91	663.52	657.90
GAIN	36.33	41.78	47.39	41.77

Differences significant (p=.000)



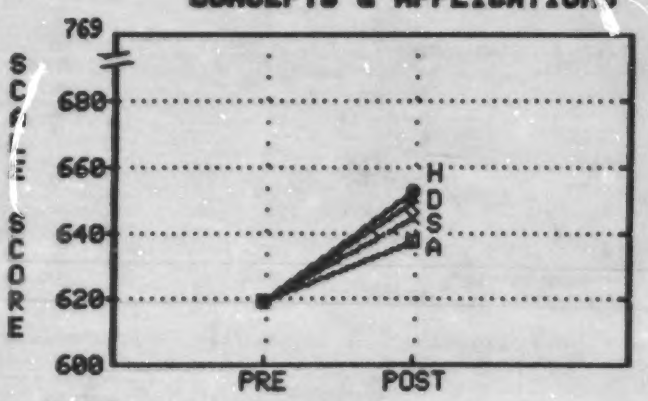
	A-W N= 304	D N=358	H N=272	S-F N=201
PRE	613.29	613.29	613.29	613.29
POST	667.36	665.95	673.44	670.57
GAIN	54.07	52.66	60.15	57.28

Differences significant (p=.027)



	A-W N= 305	D N=358	H N=272	S-F N=201
PRE	618.50	618.50	618.50	618.50
POST	637.25	649.11	652.40	644.02
GAIN	18.75	30.61	33.90	25.52

Differences significant (p=.000)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 2

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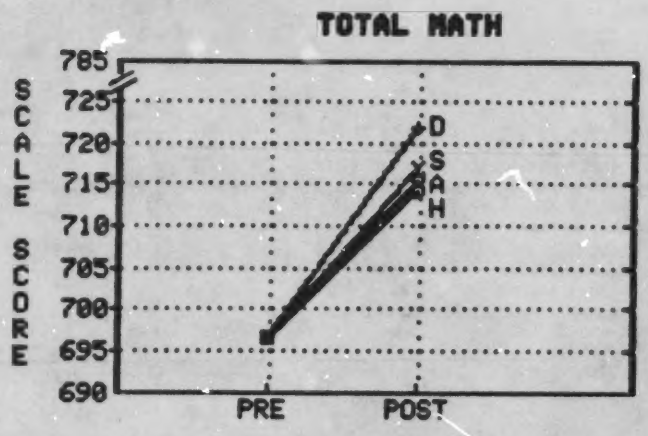
PROGRAM COMPARISONS
TOTAL MATH AND SUBTESTS*
GRADE 6

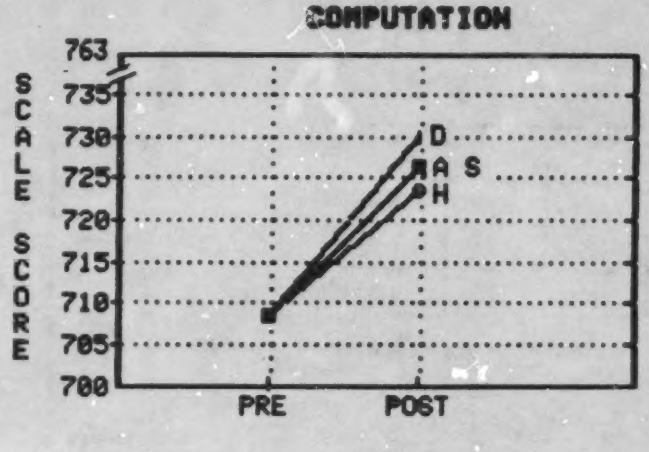
	A-W N= 410	D N= 353	H N= 322	S-F N= 258
PRE	696.44	696.44	696.44	696.44
POST	715.60	721.90	714.31	716.44
GAIN	19.16	25.46	17.87	20.00

Differences significant (p=.000)



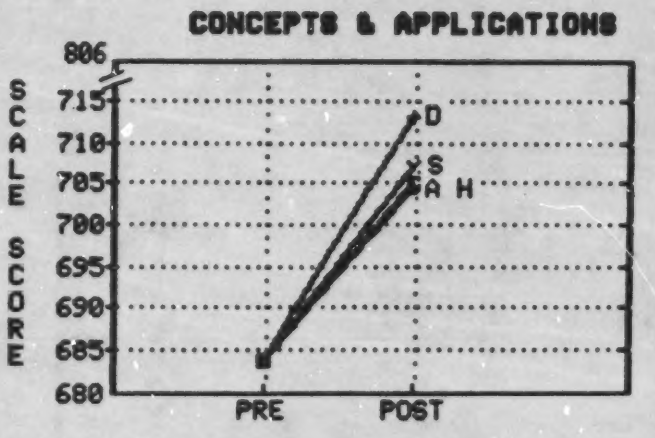
	A-W N= 410	D N= 353	H N= 322	S-F N= 258
PRE	708.54	708.54	708.54	708.54
POST	726.40	729.90	723.38	725.94
GAIN	17.86	21.36	14.84	17.40

Differences significant (p=.000)



	A-W N= 410	D N=353	H N=322	S-F N= 258
PRE	683.81	683.81	683.81	683.81
POST	705.12	713.13	704.58	706.92
GAIN	21.31	29.32	20.77	23.11

Differences significant (p=000)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

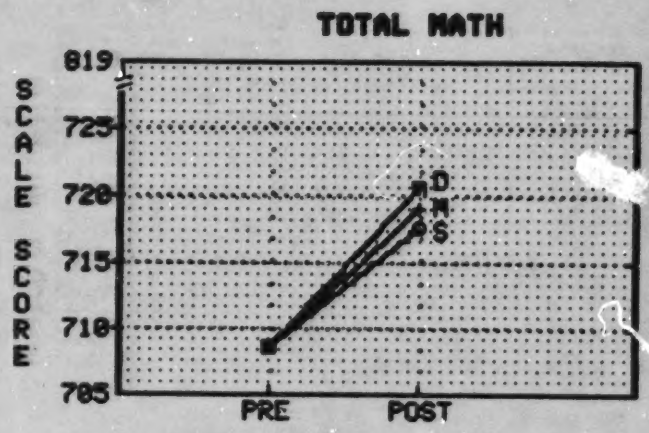
Figure 3

BEST COPY

PROGRAM COMPARISONS
TOTAL MATH AND SUBTESTS*
GRADE 8

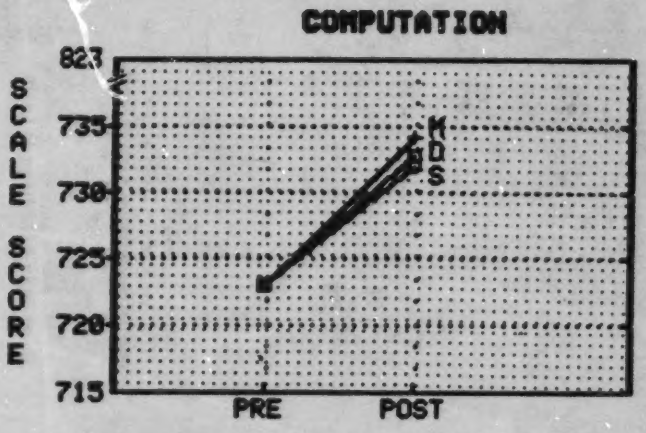
	D N= 204	M N=136	S N=130
PRE	708.42	708.42	708.42
POST	720.40	718.82	717.36
GAIN	11.98	10.40	8.94

Differences not significant (p=.057)



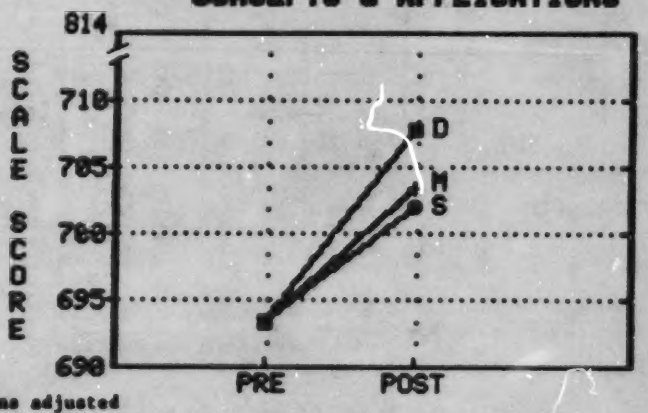
	D N= 204	M N=136	S N=130
PRE	722.99	722.99	722.99
POST	732.68	734.16	731.91
GAIN	9.69	11.17	8.92

Differences not significant (p=.251)



	D N= 204	M N=136	S N=130
PRE	693.35	693.35	693.35
POST	707.80	703.32	701.94
GAIN	14.45	9.97	8.59

Differences significant (p=.002)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
M = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 4

32

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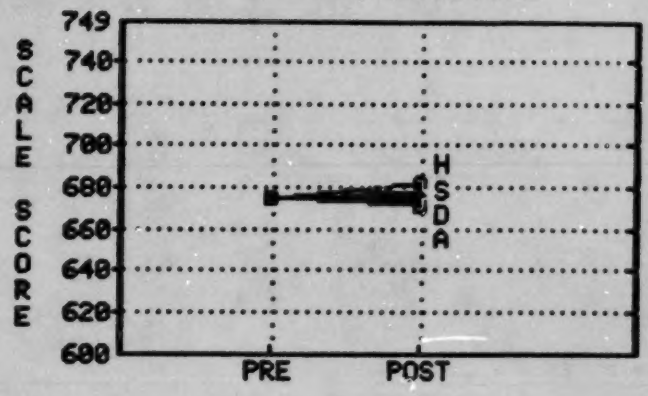
TOTAL MATH*
GRADE 3
BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	A-W N= 151	D N=175	H N=144	S-F N= 82
PRE	674.34	674.34	674.34	674.34
POST	671.65	676.36	683.15	678.93
GAIN	-2.69	2.02	8.81	4.59

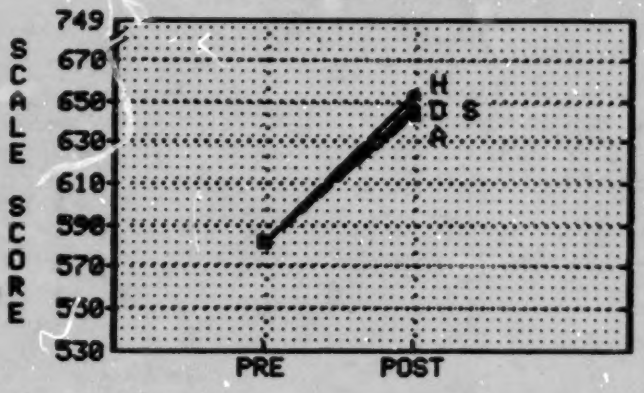
Differences significant (p=.015)



MIDDLE ACHIEVING

	A-W N= 118	D N= 135	H N=103	S-F N= 85
PRE	581.60	581.60	581.60	581.60
POST	643.10	647.01	652.58	646.60
GAIN	61.50	65.41	70.98	65.00

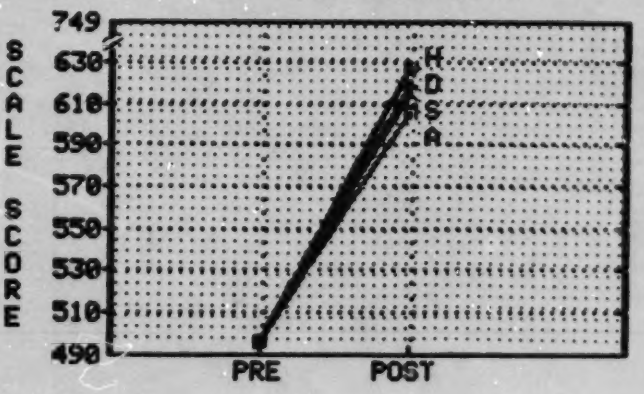
Differences <u>not</u> significant (p=.064)



LOW ACHIEVING

	A-W N= 35	D N= 47	H N= 25	S-F N= 34
PRE	496.21	496.21	496.21	496.21
POST	605.92	618.63	627.28	614.18
GAIN	109.71	122.42	131.07	117.97

Differences <u>not</u> significant (p=.290)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 5

BEST COPY

TOTAL MATH*

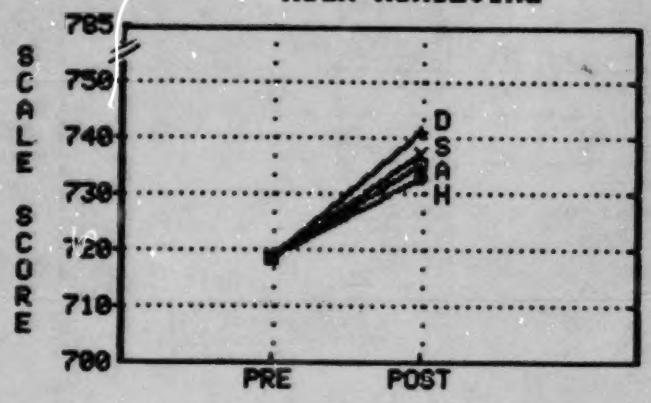
GRADE 6

BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	A-W N= 164	D N= 119	H N= 129	S-F N= 89
PRE	718.60	718.60	718.60	718.60
POST	735.22	741.26	732.66	736.98
GAIN	16.62	22.66	14.06	18.38

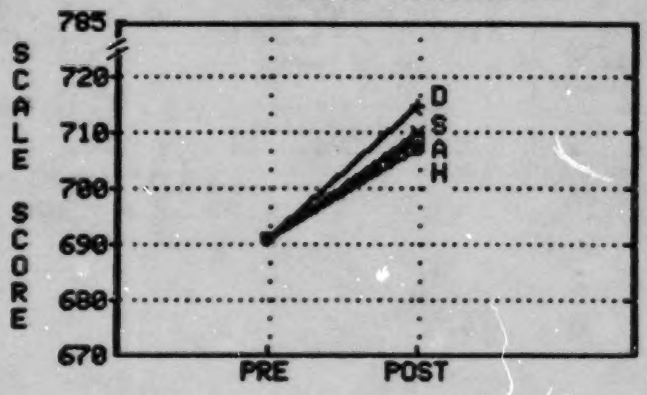
Differences significant (p=.001)



MIDDLE ACHIEVING

	A-W N= 210	D N= 185	H N= 159	S-F N= 128
PRE	690.88	690.88	690.88	690.88
POST	708.78	714.40	707.40	710.28
GAIN	17.90	23.52	16.52	19.40

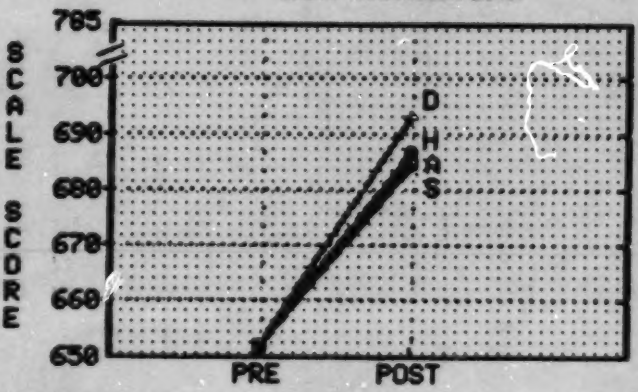
Differences significant (p=.000)



LOW ACHIEVING

	A-W N= 36	D N= 49	H N= 36	S-F N= 41
PRE	651.58	651.58	651.58	651.58
POST	684.59	692.83	686.52	683.96
GAIN	33.01	41.25	34.94	32.38

Differences <u>not</u> significant (p=.101)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 6

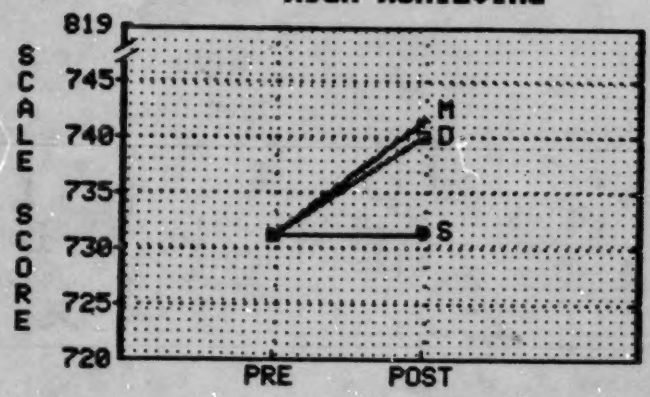
BEST COPY

TOTAL MATH*
GRADE 8
BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	D N= 23	M N= 14	S N= 6
PRE	731.05	731.05	731.05
POST	740.15	741.60	731.38
GAIN	9.10	10.55	0.33

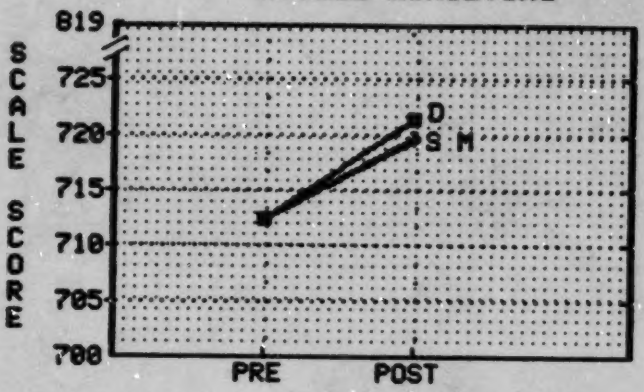
Differences not significant (p=.335)



MIDDLE ACHIEVING

	D N=138	M N= 95	S N=103
PRE	712.43	712.43	712.43
POST	721.60	719.50	719.71
GAIN	9.17	7.07	7.28

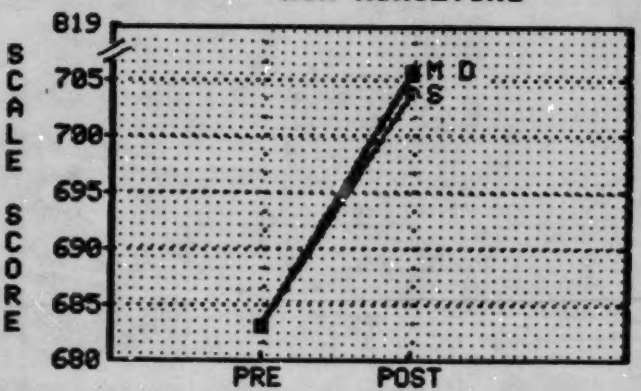
Differences not significant (p=.089)



LOW ACHIEVING

	D N= 43	M N= 27	S N= 21
PRE	682.91	682.91	682.91
POST	705.21	705.41	703.67
GAIN	22.30	22.50	20.76

Differences not significant (p=.906)



D = DISTRICT PROGRAM
M = MC GRAW HILL
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 7

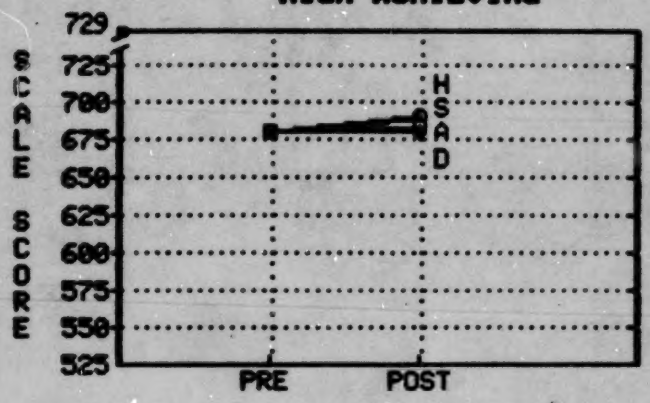
BEST COPY

COMPUTATION*
GRADE 3
BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	A-W N= 151	D N= 175	H N= 144	S-F N= 82
PRE	681.08	681.08	681.08	681.08
POST	684.05	679.77	690.99	688.87
GAIN	2.97	-1.31	9.91	7.79

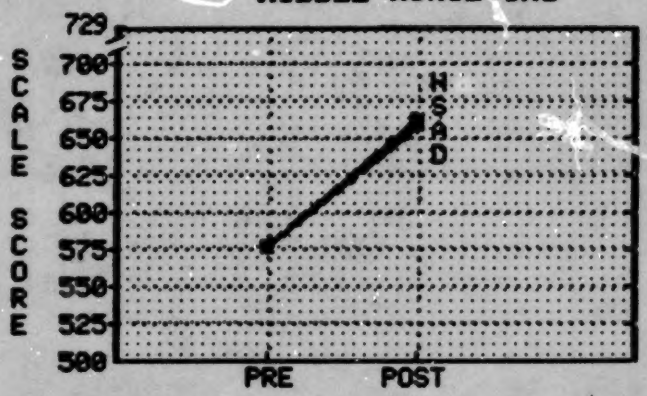
Differences significant (p=.008)



MIDDLE ACHIEVING

	A-W N= 119	D N= 136	H N= 103	S-F N= 85
PRE	576.56	576.56	576.56	576.56
POST	660.08	657.96	663.34	662.56
GAIN	83.52	81.40	86.78	86.00

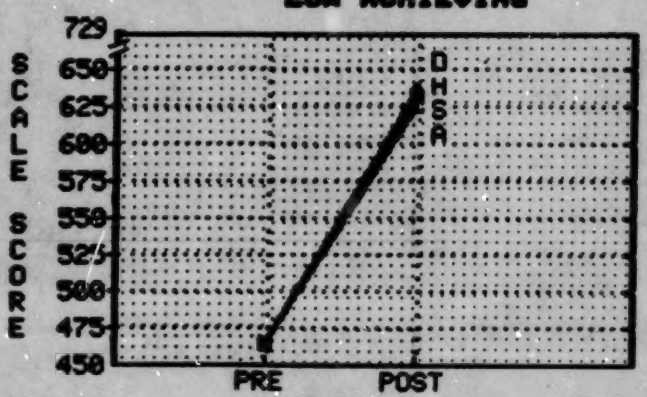
Differences <u>not</u> significant (p=.560)



LOW ACHIEVING

	A-W N= 35	D N= 47	H N= 25	S-F N= 34
PRE	463.09	463.09	463.09	463.09
POST	625.81	635.75	634.16	628.17
GAIN	162.72	172.66	171.07	165.08

Differences <u>not</u> significant (p=.712)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 8

BEST COPY

COMPUTATION*

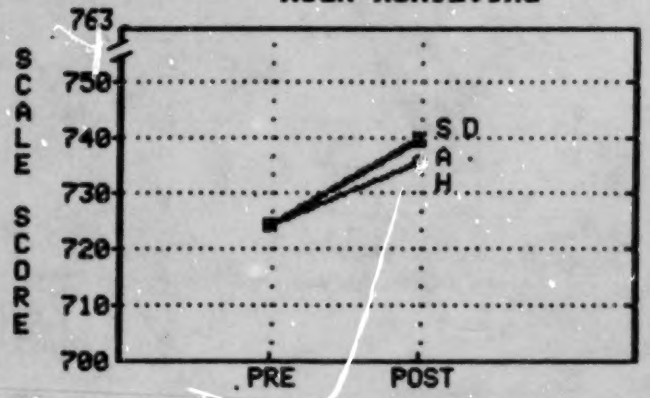
GRADE 6

BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	A-W N=164	D N=119	H N=127	S-F N=89
PRE	724.31	724.31	724.31	724.31
POST	739.66	740.10	735.71	740.22
GAIN	15.35	15.79	11.40	15.91

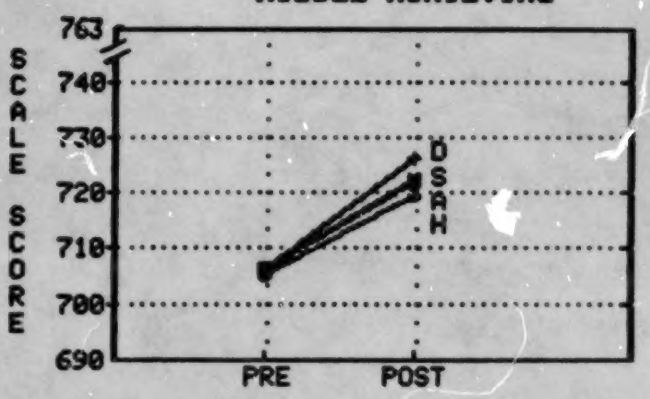
Differences significant (p=.029)



MIDDLE ACHIEVING

	A-W N= 210	D N=185	H N=159	S-F N=128
PRE	706.08	706.08	706.08	706.08
POST	721.85	726.34	719.72	722.26
GAIN	15.77	20.26	13.64	16.18

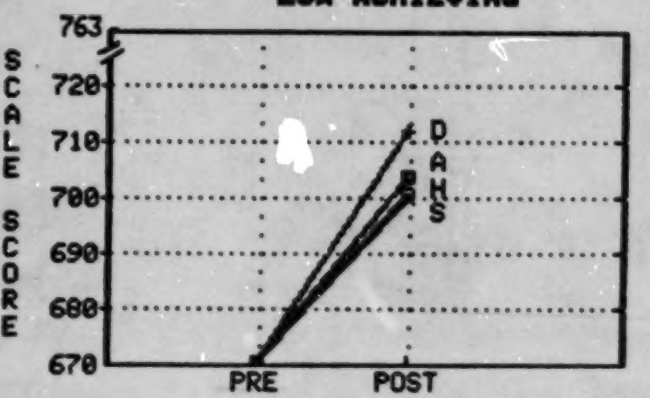
Differences significant (p=.000)



LOW ACHIEVING

	A-W N= 36	D N= 49	H N= 36	S-F N= 41
PRE	670.32	670.32	670.32	670.32
POST	703.88	712.10	700.99	699.92
GAIN	33.56	41.78	30.67	29.60

Differences significant (p=.002)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 9

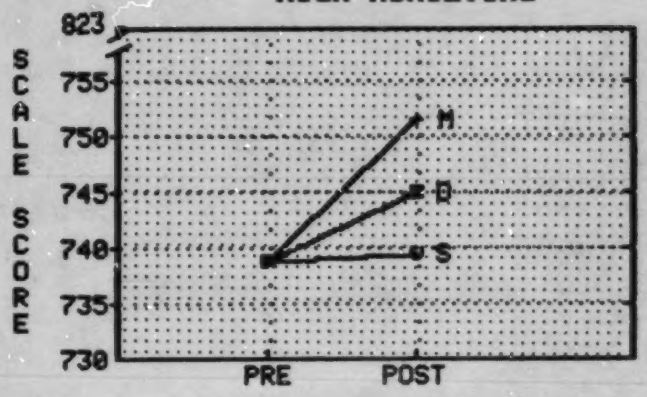
BEST COPY

COMPUTATION*
GRADE 8
BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	D N= 23	M N= 14	S N= 6
PRE	738.76	738.76	738.76
POST	744.29	751.45	739.41
GAIN	5.53	12.69	0.65

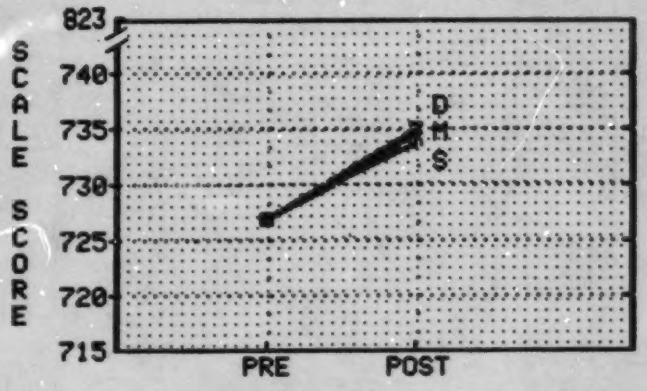
Differences not significant (p=.186)



MIDDLE ACHIEVING

	D N= 138	M N= 95	S N= 103
PRE	727.00	727.00	727.00
POST	735.02	734.68	733.73
GAIN	8.02	7.68	6.73

Differences not significant (p=.358)

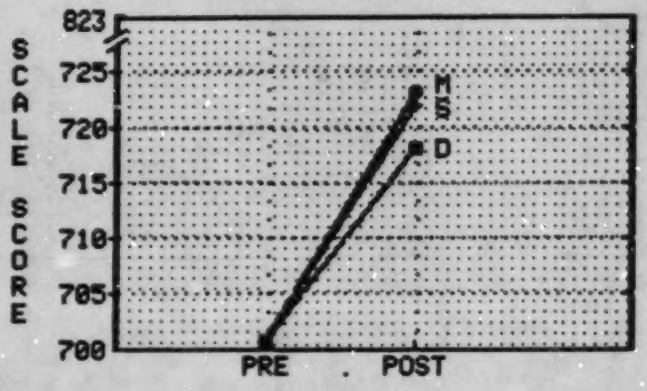


LOW ACHIEVING

	D N= 43	M N= 27	S N= 21
PRE	700.73	700.73	700.73
POST	718.13	723.23	721.95
GAIN	17.40	22.50	21.22

Differences not significant (p=.523)

D = DISTRICT PROGRAM
M = MC GRAW HILL
S = SCOTT FORESMAN



*All scores are means adjusted by using analysis of covariance.

Figure 10

BEST COPY

CONCEPTS & APPLICATIONS *

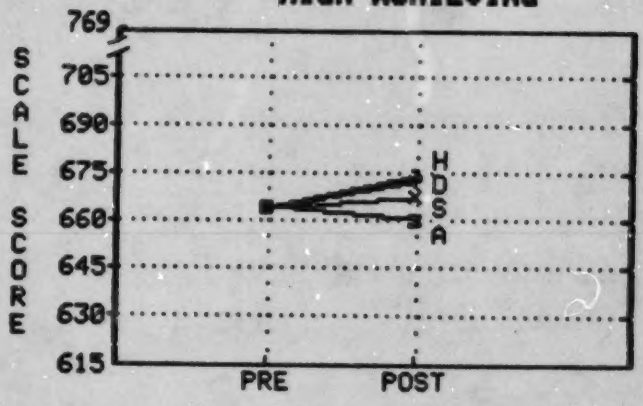
GRADE 3

BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	A-W N= 151	D N=175	H N=144	S-F N= 82
PRE	664.28	664.28	664.28	664.28
POST	660.12	672.36	674.14	667.62
GAIN	-4.16	8.08	9.86	3.34

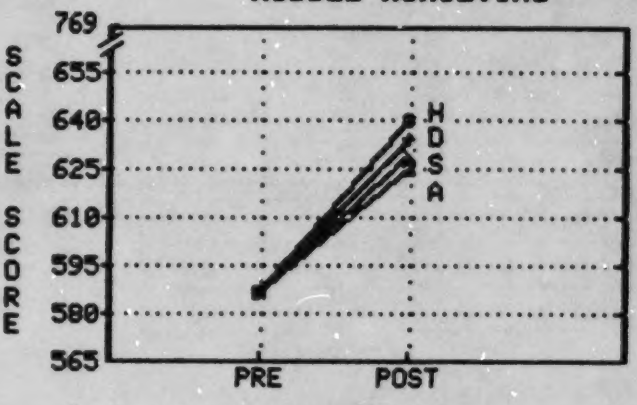
Differences significant (p=.033)



MIDDLE ACHIEVING

	A-W N= 119	D N=136	H N=103	S-F N= 65
PRE	586.22	586.22	586.22	586.22
POST	625.05	634.64	640.33	629.41
GAIN	38.83	48.42	54.11	43.19

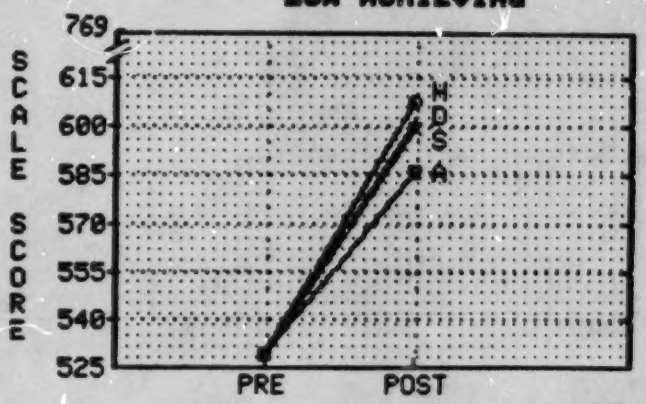
Differences significant (p=.002)



LOW ACHIEVING

	A-W N= 35	D N= 47	H N= 25	S-F N= 34
PRE	528.81	528.81	528.81	528.81
POST	585.75	601.26	607.48	599.63
GAIN	56.94	72.45	78.67	70.82

Differences <u>not</u> significant (p=.105)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 17

BEST COPY

CONCEPTS & APPLICATIONS*

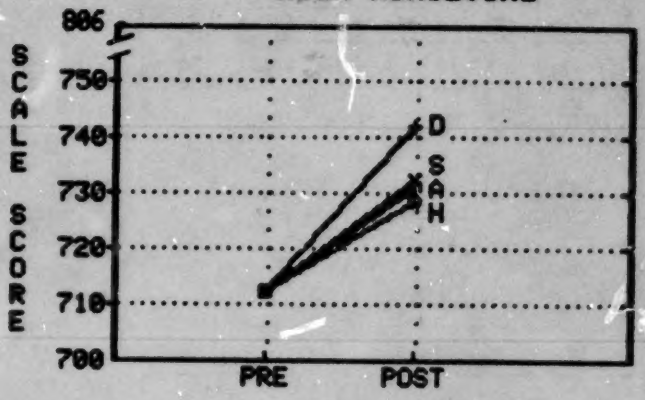
GRADE 6

BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	A-W N= 164	D N= 119	H N= 127	S-F N= 89
PRE	712.30	712.30	712.30	712.30
POST	731.06	742.07	728.36	732.58
GAIN	18.76	29.77	16.06	20.28

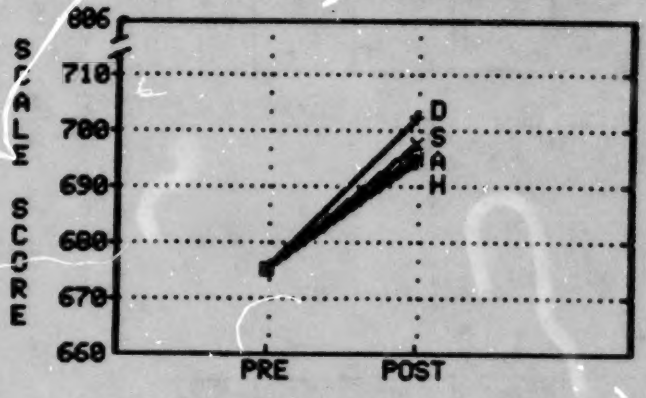
Differences significant (p= .001)



MIDDLE ACHIEVING

	A-W N= 210	D N= 185	H N= 159	S-F N= 128
PRE	675.17	675.17	675.17	675.17
POST	695.57	702.47	694.48	697.45
GAIN	20.40	27.30	19.31	22.28

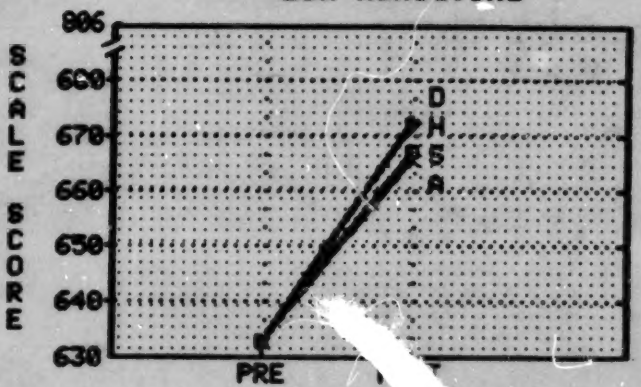
Differences significant (p=.000)



LOW ACHIEVING

	A-W N= 36	D N= 49	H N= 36	S-F N= 41
PRE	632.47	632.47	632.47	632.47
POST	665.81	672.32	671.88	667.14
GAIN	33.34	39.85	39.41	34.67

Differences <u>not</u> significant (p=.624)



A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 12

BEST COPY

CONCEPTS & APPLICATIONS*

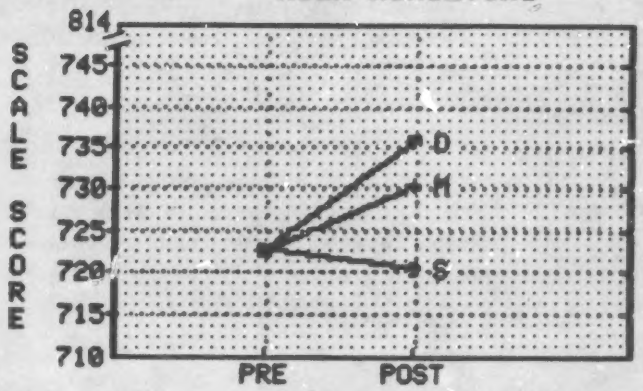
GRADE 8

BY STUDENT ACHIEVEMENT LEVELS

HIGH ACHIEVING

	D N= 23	M N= 14	S N= 6
PRE	722.65	722.65	722.65
POST	735.85	730.25	720.31
GAIN	13.20	7.60	-2.34

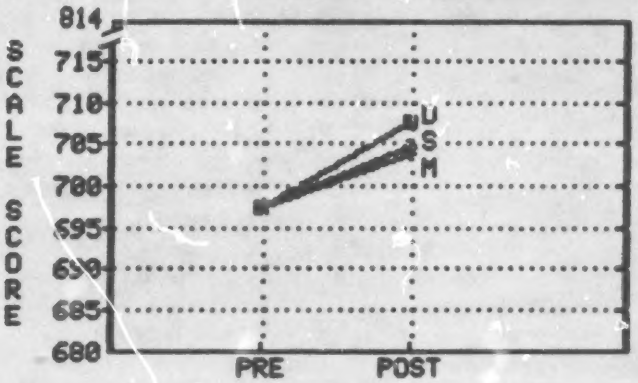
Differences not significant (p=.288)



MIDDLE ACHIEVING

	D N=138	M N= 95	S N=103
PRE	697.37	697.37	697.37
POST	707.71	703.80	704.92
GAIN	10.34	6.43	7.55

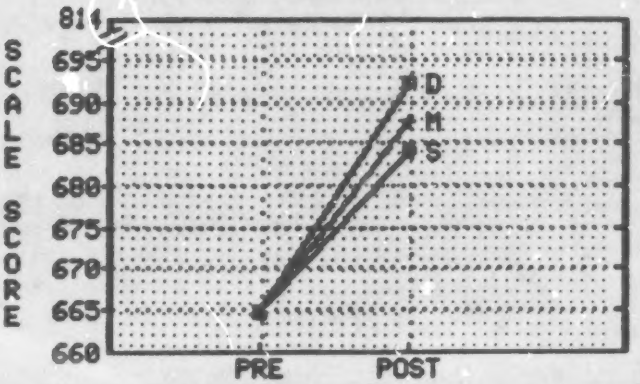
Differences significant (p=.025)



LOW ACHIEVING

	D N= 43	M N= 27	S N= 21
PRE	664.71	664.71	664.71
POST	692.31	687.81	684.26
GAIN	27.60	23.10	19.55

Differences not significant (p=.334)



D = DISTRICT PROGRAM
M = MC GRAW HILL
S = SCOTT FORESMAN

*All scores are means adjusted by using analysis of covariance.

Figure 13

BEST COPY

6. Concepts and Applications Subtest Results by Achievement Levels

Concepts and Applications Subtest results for grade 3 showed significance between programs for high- and middle-achieving students and not for low-achieving students. At grade 6, significant differences were found for the middle-achieving and high-achieving students, and no difference for the low-achieving students (Figure 12). At grade 8, differences were significant only for the middle-achieving students.

7. Supplementary Tables

Two additional kinds of information are presented in the appendices. Tables B through E in Appendix C contain the adjusted posttest means for the several variables in the study, along with the level of statistical significance. Table F converts the adjusted posttest means to equivalent percentile ranks.

IV.
DISCUSSION OF FINDINGS

A. Grade 3

In the Total Math and Concepts/Applications Subtest, students in the Heath, District, and Scott Foresman programs outperformed students in Addison-Wesley. In Computation, students in the Heath, Scott Foresman, and Addison-Wesley programs made greater gains than students in the District program. High-achieving students in Heath and Scott Foresman performed better than high-achieving students in the District or Addison-Wesley programs; middle-achieving students performed better in the Heath program. There were no differences in the posttest performance of students in the low-achieving groups among the programs. Heath appears to be the program which most enhances student achievement at grade 3.

At grade 3, a ceiling effect exists, particularly for the group of high-achieving students. They are scoring on the average within two raw scores from the top of the test. The ceiling effect is not problematic for middle- or low-achieving students, nor is it a problem for the total group of students. For the high-achieving students, we do not know from the test results whether the programs address their needs since the ceiling effect prevents showing their progress.

B. Grade 6

In grade 6, the District program students made more gains than students in the three commercial programs in Total Math, Computation, and Concepts/Applications. High-achieving students performed equally well in the District, Scott Foresman and Addison-Wesley programs, and less well in the Heath program. Middle-achieving students in the District program had higher posttest performance overall than the other three programs, and low achieving students scored better on the District program on Computation.

C. Grade 8

At grade 8, there were no significant differences on the Total Math and Computation Subtest. On the Concepts and Applications Subtest, the students in the District program had higher posttest scores than students in either Scott Foresman or McGraw-Hill. The only significant difference for high-, middle-, or low-achieving students among programs at the eighth grade was in Concepts and Applications for middle-achieving students where the District program students achieved higher scores.

D. Summary

Clearly, all programs are adequate or "good" programs for the teaching of mathematics, as shown by the percentile rank of the adjusted mean scores. See Appendix C. All programs showed gains from pre- to posttests. Differences are noted between the results for grades K-3, represented by the grade 3 scores, and for grades 4-6, represented by the grade 6 scores. Heath, the District and Scott Foresman programs tend to be stronger at grade 3 than Addison-Wesley. However, the District program is the strongest at the sixth-grade level. In the area of Computation, results are mixed, as shown above, but in the area of Concepts and Applications, the District program appears to be strong at all three grade levels, with Heath also very strong at the third grade.

V.
DISCUSSION OF STATISTICALLY SIGNIFICANT DIFFERENCES

Table 1 presents a summary of the 19 statistically significant findings along with the associated publisher's text that had the highest adjusted posttest mean scale score in each of the covariance analyses. It is important to point out that the highest scoring publisher out of the four for grades 3 and 6 and the three for grade 8 was not necessarily beyond a chance level of difference from all the others--often, it was only the difference between the highest and the lowest performing publishers in a given set of comparisons. However, the chances of the same publisher always or nearly always obtaining the highest adjusted mean score in each set is similar to the odds against repeatedly flipping a coin and consistently obtaining "heads."

In the case of the grade 3 findings in Table 1, out of the seven statistically significant comparisons among the four publishers, Heath consistently had the highest adjusted mean scale score. The probability of such a finding occurring by chance is unlikely.

For the results in grade 6, out of the ten statistically significant comparisons among the four publishers, the District program consistently had the highest value in nine out of the ten comparisons. The probability of this finding occurring by chance is also unlikely.

For grade 8, the fact that only 2 of the possible 12 comparisons were statistically significant were too few to say that chance is unlikely. Nevertheless, the District, once again, obtains the highest mean scale score in both instances, at least continuing the trend from grade 6.

Table 1

Statistically Significant Differences

GRADE 3	PROGRAM*	LEVEL OF SIGNIFICANCE
Total Math, All Students	Heath	.000
Computation, All Students	Heath	.027
Concepts/Applications, All Students	Heath	.000
Total Math, High Achievers	Heath	.015
Computation, High Achievers	Heath	.008
Concepts/Applications, Middle Achievers	Heath	.002
Concepts/Applications, High Achievers	Heath	.033
GRADE 6		
Total Math, All Students	District	.000
Computation, All Students	District	.000
Concepts/Applications, All Students	District	.000
Total Math, High Achievers	District	.001
Total Math, Middle Achievers	District	.000
Computation, High Achievers	Scott Foresman	.029
Computation, Middle Achievers	District	.000
Computation, Low Achievers	District	.002
Concepts/Applications, High Achievers	District	.001
Concepts/Applications, Middle Achievers	District	.000
GRADE 8		
Concepts/Applications, All Students	District	.002
Concepts/Applications, Middle Achievers	District	.025

*Program listed has the highest adjusted mean score out of the several piloted programs.

It is reasonable to conclude that, on the basis of these results, Heath has an overall advantage in grade 3 and the District the same in grade 6, with at least a consistent pattern beginning to appear in grade 8.

Because of the consistency, with one exception, between the various achievement levels and a single publisher at each of the three grade levels, the benefits to any given achievement level coincide with that single publisher. The one exception is high achievers associated with Scott Foresman, rather than the District, in Computation in grade 6. Thus, high achievers are associated with Heath in grade 3 and the District in grade 6 (excepting Computation with Scott Foresman). Middle achieving students follow the same pattern without exception. Low achieving students only reach statistical significance once (Computation, grade 6). When all students are taken together, the pattern is strongest and most complete for Heath in grade 3 and for the District program in grade 6.

PART THREE

COST-EFFECTIVENESS

PART THREE
COST EFFECTIVENESS

I.
INTRODUCTION

This section provides information relating to costs of the math pilot textbooks and materials combined with effectiveness of the programs in student achievement. The resulting ratio on page 42, shows the cost-effectiveness or efficiency of each of the programs.

II.
PROCEDURES

Henry M. Levin[1], an educational researcher from Stanford University, has provided comprehensive research on cost analysis for education. The district has adopted a Levin model for gathering cost data for the Mathematics Pilot. Grades 3, 6, and 8 were selected for collection of cost analysis data because those grade levels provide norm referenced test information across all schools participating in the Math Pilot. All the possible factors/variables, called "ingredients," that might have a possible cost impact upon any of the curricula are listed. An examination of each possible cost is then undertaken to determine whether the cost is unique to any one program, if the cost differs amongst the curricula, or if the costs are the same across all curricula, and therefore a factor which can be descriptive only. The last section of Part Three describes the ingredients in categories of personnel, materials and equipment, facilities and client inputs and shows these in chart form.

III.
FINDINGS

A. General Discussion

After investigating the ingredients of the programs, it was determined that no one curriculum inherently required significantly different expenditures for personnel or facilities. Materials costs, however, were specific to individual curricula and form the basis of the cost analysis. A variation

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[1]Cost-Effectiveness - A Primer (New Perspectives in Evaluation, Volume 4) by Henry M. Levin (1983)

existed in the number of classroom aides in programs. Since the aides were employed prior to the pilot and were not a requirement of any program, these costs are reported but not included in the final cost determination.

Concerning materials, a discrepancy existed between actual numbers of books ordered and a theoretical one-book-per-student cost. Both sets of costs are included. First-year costs are presented as well as costs prorated over a six-year adoption cycle. Longevity considerations are necessary in order to compare programs utilizing consumable materials with those using hard-bound texts.

Program effectiveness figures, based on student achievement gains, were combined with costs to give cost-effectiveness ratios (page 42). The differences in the cost-effectiveness ratios between programs are greater at grades 6 and 8 than at grade 3.

B. First-Year Materials Costs

Two methods were used to compute per student materials expenditures. The "actual cost" figure is based on the actual monies expended for materials with one exception: duplicating costs for individual grade levels could not be directly ascertained and are drawn from the estimates requested by the board presented in the 10/7/84 memo attached in Appendix D.

The "theoretical cost" figure is based on a cost of one text per student, and the additional component costs are "theoretical" estimates from the same memo.

The theoretical per student costs are presented because of the wide variation in actual per student materials costs existing from site to site.

At the elementary level, when comparing grade level texts ordered with actual student enrollments for both third and sixth grades combined, the following indices were generated:

Addison-Wesley	1.3 texts ordered per student
District	1.4 texts ordered per student
Heath	1.3 texts ordered per student
Scott, Foresman	1.4 texts ordered per student

The following cautions must be noted when considering the above indices. Assessment of "out of level" materials is complicated because it is difficult to discern whether "overages" at a given grade are due to:

1. "faster" students from preceding grade, or "slower" students from an ensuing grade,

2. a site perceived opportunity to amass materials at no expense,

3. emergency stockpiling,

4. needs due to VEEP/INTEGRATION multi-school interactions,

5. enrollment fluctuations, or

6. a combination of these possibilities.

Table 1 presents the range of actual per student materials costs generated at individual sites for each publisher.

Table 1

RANGE OF ACTUAL PER STUDENT MATERIALS COSTS
GENERATED AT INDIVIDUAL SITES
FOR EACH PUBLISHER

Publisher	Grade 3 Range	Grade 3 Mean	Grade 3 Std. Dev.*	Grade 6 Range	Grade 6 Mean	Grade 6 Std. Dev.*
Addison-Wesley	10.28-19.68	11.72	2.48	12.56-24.25	16.13	3.86
District	7.35-11.36	8.70	1.26	5.33-11.90	6.94	1.71
Heath	10.04-16.52	11.97	1.95	11.97-22.13	13.81	2.58
Scott, Foresman	8.78-18.18	12.33	2.51	12.20-38.62	19.38	8.21

*Standard Deviation

Table 2 summarizes the three grades and their respective costs, both Actual and Theoretical for the one year of the pilot, 1983-84. In addition, it shows the percent by which each actual cost exceeded the "theoretical" cost. For grades 3 and 8 these percents are similar, along with three out of four curricula for grade 6. At this grade level, one text for the ensuing grade (grade 7) was ordered more than any of the other texts.

Table 2
COMPARISON OF PER STUDENT MATERIAL COSTS
THEORETICAL AND ACTUAL MODELS

Publisher	Grade 3 Theor. Cost	Grade 3 Act. Cost	Grade 3 %* Act. Exc.	Grade 6 Theor. Cost	Grade 6 Act. Cost	Grade 6 %* Act. Exc.	Grade 8 Theor. Cost	Grade 8 Act. Cost	Grade 8 %* Act. Exc.
Addison-Wesley	9.34	11.72	25	11.92	16.13	35			
District	6.44	8.70	35	5.12	6.94	36	4.40	5.89	34
Heath	8.98	11.97	33	10.63	13.81	30			
McGraw-Hill							11.98	15.62	30
Scott, Foresman	9.47	12.33	30	11.42	19.38	71	13.27	18.23	37

*% by which Actual Costs Exceed Theoretical Costs

Table 3

COMPUTATION OF PER STUDENT MATERIALS COSTS

GRADE 3

Components	Publisher							
	Addison		District		Heath		Scott, Foresman	
	Theor.	Actual	Theor.	Actual	Theor.	Actual	Theor.	Actual
Text[1]	$6.08	$8.39	$6.44	$8.70	$6.93	$9.62	$6.68	$9.45
Test master[2]	1.66	1.73	0	0	1.07	1.37	1.66	1.75
Enrich/reteach master[3]	0	0	0	0	0	0	0	0
Duplicating Costs[4]	1.60	1.60	0	0	.98	.98	1.13	1.13
Supplemental Texts[5]	0	0	0	0	0	0	0	0
Total	9.34	11.72	6.44	8.70	8.98	11.97	9.47	12.33

GRADE 6

Components	Publisher							
	Addison		District		Heath		Scott, Foresman	
	Theor.	Actual	Theor.	Actual	Theor.	Actual	Theor.	Actual
Text[1]	$8.66	$10.22	$5.12	$6.94	$8.58	$10.83	$8.63	$12.10
Test master[2]	1.66	1.63	0	0	1.07	1.03	1.66	2.75
Enrich/reteach master[3]	0	0	0	0	0	0	0	0
Duplicating Costs[4]	1.60	1.60	0	0	.98	.98	1.13	1.13
Supplemental Texts[5]	0	2.68	0	0	0	.97	0	3.40
Total	11.92	16.13	5.12	6.94	10.63	13.81	11.42	19.38

GRADE 8

Components	Publisher					
	District		McGraw-Hill		Scott, Foresman	
	Theor.	Actual	Theor.	Actual	Theor.	Actual
Text[1]	$4.40	$5.31	$10.95	$14.46	$10.48	$16.38
Test master[2]	0	0	.91	1.04	1.66	.72
Enrich/reteach master[3]	0	0	0	0	0	0
Duplicating Costs[4]	0	0	.12	.12	1.13	1.13
Supplemental Texts[5]	0	.58	0	0	0	0
Total	4.40	5.89	11.98	15.62	13.27	18.23

[1]"Theoretical" text cost = Price of text (How much it would cost to supply one text per student).

"Actual" text cost = (Number of grade level texts sent to site x per unit cost) ÷ number of students at that grade level.

[2]"Theoretical" test master cost = (Cost of test master x number of teachers) ÷ number of students (memo of 10/7/83, assumptions regarding number of students and teachers).

"Actual" test master cost = (Number of test masters sent to site x per unit cost) ÷ number of students at that grade level.

[3]Publishers provided these materials without cost this year. However, historically, there has been a charge.

[4]Duplicating cost = Total cost of duplicating materials ÷ estimated number of students. (Computed from 10/17/83 memo estimates.)

[5]Out of level texts reported

Table Set 3 on page 38 displays the per student materials cost computations of grades 3, 6, and 8 using both theoretical and actual models.

C. Consideration of Longevity of Materials

Thus far, only the material costs for the one year of the pilot have been discussed. For informational purposes, Table 4 shows how the various curricula differ with regard to their longevity. Since hard-bound texts are not the equivalent of consumable pads/workbooks, this variable must be considered as an important factor in determining curriculum costs over the life of an adoption. Table 4 shows how the various grades differ in their "longevity" or life expectancy.

Table 4
LONGEVITY OF TEXTS/MATERIALS
IN MATH PILOT STUDY

Components	Grade 3	Grade 6	Grade 8
Commercial Materials			
Student text	1 year	life of adoption	life of adoption
Teacher duplicating masters	1-2 years	1-2 years	1-2 years
Teacher editions	life of adoption	life of adoption	life of adoption
District Materials			
Student Booklet	1 year	2 years	2 years
Student Worksheets	1 year	1 year	1 year
Advanced student unit	1 year	1 year	none
Teacher guides, answer key	life of adoption	life of adoption	life of adoption

The following Table 5 reflects, for materials only, the dollar amounts that include the longevity/replacement factors previously discussed and shown in Table 4. The purpose of Table 5 is to show, as equitably as possible those costs which accrue to each of the curricula when the appropriate longevity/replacement factor was applied for the life of the adoption, namely six years. The per student yearly cost, including the longevity factor may be compared directly with the next column, the first year per student cost without the longevity factor, for grades 3, 6, and 8.

Table 5
EXTENSION OF FIRST YEAR THEORETICAL COSTS
OVER A REGULAR SIX YEAR ADOPTION CYCLE

	Text Cost[1] x Replacement Factor +	Duplicating[2] Costs x Replacement ÷	6 Year Assumed Adoption =	Per Student Yearly Cost Considering Longevity	1st Yr. per Student Cost (Without Longevity Factor)
Grade 3					
Addison-Wesley	36.48	16.24	6	8.79	9.34
District	38.64	0	6	6.44	6.44
Heath	41.58	10.16	6	8.62	8.98
Scott, Foresman	40.08	13.42	6	8.92	9.47
Grade 6					
Addison-Wesley	13.86	16.24	6	5.02	11.92
District	20.48	0	6	3.41	5.12
Heath	13.73	10.16	6	3.98	10.63
Scott, Foresman	13.81	13.42	6	4.54	11.42
Grade 8					
District	13.20	0	6	2.93	4.40
McGraw-Hill	17.52	4.36	6	3.65	11.98
Scott, Foresman	16.77	13.42	6	5.03	13.27

[1]Textbook replacement factors:

Grade 3: All consumable texts. Replacement factor of 6 since replaced each year.

Grade 6 and 8: Commercial texts hardbound. Replacement factor of 1.6 considering 10% replacement each year.
District materials softbound; therefore, replaced each two years.

[2]Duplicating costs replacement factors:

Teacher masters replaced each 1-2 years. Replacement factor of 4.
Duplicating supplies required each year. Replacement factor of 6.

Table 5 may be most usefully considered by examining grades 3 and 6 as a separate entity from grade 8. When ranking the elementary curricula for materials only, the District and Heath remain in first and second positions as least expensive, with Scott, Foresman and Addison-Wesley alternating in third and fourth as least expensive programs. When contemplating an adoption life of six years, the material costs at grade 3, with the exception of the District, are within $.30 of each other; at grade 6, adjacent commercial curricula, after ranking, are within $.50 per pupil of each other. At grade 8, the duplicating costs for Scott, Foresman and Company are noted to be high since the source document for this index averaged duplicating costs over grades K-8. (The premise is that secondary students usually have lower duplicating costs than primary students.)

D. Instructional Aide Costs

Table 6 displays the impact of instructional aide costs on per student costs. Classroom aides are not a requirement of any of the curricula and were assigned and in place prior to the math pilot. They were not uniformly present at any grade level. At grade three the publisher's percentages of classrooms having aides ranged from 77 to 100%. At grade six the range was 52-94%, and at grade 8 it was 0-77%.

The existence of the variation between publishers in regard to the presence of classroom aides is a function of the selection process for schools accepted in the math pilot.

Table 6
THE IMPACT OF AIDE COSTS ON
PER STUDENT COST COMPUTATIONS

Publisher	% of Classrooms Having Aides	Computed[1] per Student Cost	+	Per Student[2] Aide Cost by Curriculum	=	Per Student Cost Incl. Aide Cost
Grade 3						
Addison-Wesley	77.3	9.34		18.62		27.96
District	92.6	6.44		22.30		28.75
Heath	100.0	8.98		24.09		33.07
Scott, Foresman	100.0	9.47		24.09		33.56
Grade 6						
Addison-Wesley	60.0	11.92		14.45		26.37
District	52.2	5.12		12.57		17.69
Heath	94.1	10.63		22.67		33.30
Scott, Foresman	80.0	11.42		19.27		30.69
Grade 8						
District	76.9	4.40		18.53		22.93
McGraw-Hill	18.2	11.98		4.38		16.36
Scott, Foresman	0	13.27		0		13.27

[1]Theoretical Model

[2]Per student aide cost computations:

Step 1
[Average hourly rate (4.79) x number instructional days (176)] - student/classroom (35) = per student aide cost ($24.00)

Step 2
Per student aide cost by curriculum = per student aide cost (24.09) x percent of classes having aides.

E. Cost-Effectiveness

The data show the District program to be the least expensive at all three grade levels. However, the cost differential between the programs is not great. A cost-effectiveness ratio has been calculated to show relative costs per gain in student achievement. For the cost-effectiveness ratios shown in Table 7, scale score gains are divided by the per student cost of materials prorated over the six year adoption cycle.

Table 7
COST-EFFECTIVENESS RATIOS

GRADE 3	Addison-Wesley	District	Heath	Scott, Foresman
Per Student Cost* / Mean Scale Score Gain	$ 8.79 / 36.33 = $.24	$ 6.44 / 41.78 = $.15	$ 8.62 / 47.39 = $.18	$ 8.92 / 41.77 = $.21

GRADE 6	Addison-Wesley	District	Heath	Scott, Foresman
Per Student Cost* / Mean Scale Score Gain	$ 5.02 / 19.16 = $.26	$ 3.41 / 25.46 = $.13	$ 3.98 / 17.87 = $.22	$ 4.54 / 20.00 = $.22

GRADE 8	District	McGraw-Hill	Scott, Foresman
Per Student Cost* / Mean Scale Score Gain	$ 2.93 / 11.98 = $.24	$ 3.65 / 10.44 = $.35	$ 5.03 / 8.94 = $.56

*Student materials cost computed on theoretical model prorated over the six year adoption cycle.

At grade 3, the greatest gains appear in the Heath text at a cost of six cents more than the least expensive program. At grades 6 and 8, the District program shows greatest gains and is also the least expensive program. Cost-effectiveness differentials are not great at third grade, but increase at grades 6 and 8.

IV.
COST ANALYSIS INGREDIENTS

A. Personnel

Curriculum Development. According to cost figures supplied by the Educational Services Division, developmental costs for the District Math Program over a two-year period included the costs of Resource Teachers ($143,675), Production of Materials ($70,000), Advanced Package ($44,458), and Benefits ($42,878) for a total of $301,011.

If the $301,011 were included, the District Math Program costs would increase by an average of $.62 per student (considering K-8 and amortized over a typical six-year cycle). This would raise the per student cost of the District program by 11% at grade 3 to 21% at grade 8 and would reduce the cost-effectiveness. The development cost figures do not include printing, portion of on-the-job or contributed management time, or teacher time for in-depth review of lessons.

The cost analysis does not include these developmental costs for the following reasons:

1. The costs are "sunk" costs; that is, the program was developed prior to the request of and initiation of the pilots. The money has already been spent and would not be recovered regardless of outcome.

2. Commercial publishers would not supply developmental costs for their textbooks.

3. It is difficult to compare district-developed costs with commercial publisher costs because commercial publishers produce for nationwide consumption, whereas district costs are divided by the number of K-8 students (roughly 77,600). However, it is assumed that developmental costs of commercial publishers are built into their pricing scheme.

Central resource teachers and other central office personnel. Duties assigned these personnel have been determined to be equivalent across all curricula, with one person assigned to pilot curricula to represent the commercial texts, and one assigned to the District Program for answering questions, giving counsel, etc. These determinations are based on data from interviews with the respective persons assigned as well as by logs maintained by the resource teachers, supporting this position. No one program required more assistance/time than any other program.

Site Resource Teachers. These teachers served their sites as coordinators/disseminators of information/materials across all pilots in the study. Each of the curricula carried equivalent costs.

Classroom Teachers. These teachers, already in place at their sites as the pilot commenced, carried equivalent costs across all curricula. Teachers were not assigned to math curricula by salary criteria.

Principals. Administrators, already assigned to schools, were not considered to have any cost implication for our study. Level of effort in monitoring programs was considered equivalent across all pilots.

Classroom aides. Classroom instructional aides were present in 80% of pilot classrooms at grades 3 and 6 and in 40% of 8th grade pilot classrooms. The percentages of classrooms with aides varied from curriculum to curriculum. However, aides are not an intrinsic requirement of any curriculum and were in place prior to the math pilot. The aide costs are noted on the Worksheet for Estimating Costs. They were computed on the basis of one hour instructional time per day (rate $4.79 per hour) times the 176 instructional days in a year. Since no curriculum had intrinsic aide requirements, aide costs are not included in the primary cost analysis. However, the impact of aide costs is discussed in the findings section.

Publisher's representative time. Publishers' representatives were available to the schools through the central resource teachers and by phone when appropriate. Each of the curricula had equivalent inservice time made available to them by the district, and no unique cost implication was evidenced by any one of the curricula.

B. Materials and Equipment

Student Texts. The number of student textbooks ordered by each site for each grade level was recorded. Teachers were instructed to notify the central office of any use of out-of-level texts. In fact, very few schools reported out of level texts being used, either indicating the basic texts covered that grade level's curriculum adequately, or teachers used available out-of-level texts without reporting that use. Total text costs for each publisher are listed on the Worksheet for Estimating Costs, page 46.

Teacher Guides/Instructive Kits. These materials were provided free this year and would continue to be free on the basis of one guide/kit per 25 texts ordered. No cost implication.

Test Masters. Total costs of these packets are listed for each publisher.

Enrichment Masters. These were provided free this year for the pilot. No cost implication for the pilot, although estimates for the future may need to include a cost here.

Duplicating Supplies. These data were derived from per pupil costs, developed per board request, and communicated to the board in 10/7/83 memo (Appendix B) times the number (N) at each school. The number at each site was determined by using the average of the enrollments in November and the end of the first semester.

Manipulatives and Calculators. These materials, most of which were already in place in classrooms, were not required by any of the curricula and were considered equivalent across all pilots.

C. Facilities

Classrooms. Each of the curricula were designed for self-contained classrooms. No additional cost implications for any given curricula.

Office Space for Resource Teacher (site). No one curriculum reflected any greater space requirement due to the uniqueness of its curriculum than any other. No cost implication for this item.

Storage Space. No one curriculum required any more storage requirements than any other to the extent that there was a cost implication.

D. Client Input

Volunteers. Although the contributed time of parent volunteers, peer tutor volunteers and others may have cost implications and may contribute to the success of the program, an assumption of even distribution across schools was made. It was also assumed that these programs and contributed times are likely to occur regardless of program adopted; therefore these costs are not crucial to a decision of which program to adopt. Had there been an indication that one or more programs used volunteer time substantially more than others, these costs would have been included.

WORKSHEET FOR ESTIMATING COSTS

Personnel

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Personnel					
Curriculum development		Commercial costs unavailable. District $301,011			
Central resource teachers and other central office personnel		See description			
Site resource teachers			See description (Consolidated Application)		
Classroom teachers/ class size		See description			
Principal		See description			
Publisher's representative's time			See description		

Figure 1

WORKSHEET FOR ESTIMATING COSTS

Personnel

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Personnel (cont.) Site aides	Grade 3 Addison $ 14,332 District 21,076 Heath 14,332 Scott, Foresman 13,489 Grade 6 Addison $ 10,116 District 10,116 Heath 13,489 Scott, Foresman 10,116 Grade 8 District $ 8,430 McGraw-Hill 1,686		(Chapter 1, SIP, etc.) Grade 3 Addison $ 14,332 District 21,076 Heath 14,332 Scott, Foresman 13,489 Grade 6 Addison $ 10,116 District 10,116 Heath 13,489 Scott, Foresman 10,116 Grade 8 District $ 8,430 McGraw-Hill 1,686		

Figure 1 continued

ADDISON-WESLEY

WORKSHEET FOR ESTIMATING COSTS

Materials and Equipment

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Materials and Equipment				(Addison-Wesley)	
Student texts	Gr. 3 $ 3,825.96 Gr. 6 6,463.57	$ 3,825.96 6,463.57			
Teacher guides	Gr. 3 392.08 Gr. 6 297.44			$ 392.08 297.44	
Test masters	Gr. 3 785.97 Gr. 6 815.32	785.97 815.32			
Enrichment masters				See description	
Duplicating supplies	Gr. 3 729.31 Gr. 6 803.23	729.31 803.23			
Manipulatives and Calculators		See description			

Figure 2

WORKSHEET FOR ESTIMATING COSTS

DISTRICT

Materials and Equipment

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Materials and Equipment					
Student texts	Gr. 3 $ 5,082.77 Gr. 6 4,254,72 Gr. 8 2,200.00	$ 5,082.77 4,254.72 2,200.00			
Teacher guides	included above	included above			
Test Masters	not applicable				
Enrichment masters	not applicable				
Duplicating supplies	not applicable				
Manipulatives and Calculators		See description			

Figure 2 continued

WORKSHEET FOR ESTIMATING COSTS

HEATH

Materials and Equipment

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Materials and Equipment				(Heath)	
Student texts	Gr. 3 $ 3,374.91 Gr. 6 4,418.70	$ 3,374.91 4,418.70			
Teacher guides	Gr. 3 365.00 Gr. 6 321.00			365.00 321.00	
Test masters	Gr. 3 478.50 Gr. 6 421.08	478.50 421.08			
Enrichment masters				See description	
Duplicating supplies	Gr. 3 344.29 Gr. 6 399.72	344.29 399.72			
Manipulatives and Calculators		See description			

Figure 2 continued

WORKSHEET FOR ESTIMATING COSTS

MCGRAW-HILL

Materials and Equipment

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Materials and Equipment				(McGraw-Hill)	
Student texts	Gr. 8 $ 3,920.10	$ 3,920.10			
Teacher guides/ instructional kit	269.10			$ 269.10	
Test masters	280.65	280.65			
Duplicating supplies	32.66	32.66			
Manipulatives and Calculators		See description			

Figure 2 continued

WORKSHEET FOR ESTIMATING COSTS

SCOTT FORESMAN & CO.

Materials and Equipment

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Materials and Equipment				(Scott Foresman)	
Student texts	Gr. 3 $ 3,072.80	$ 3,072.80			
	Gr. 6 4,030.21	4,030.21			
	Gr. 8 3,668.00	3,688.00			
Teacher guides	Gr. 3 306.60			$ 306.60	
	Gr. 6 321.20			321.20	
	Gr. 8 101.94			101.94	
Test masters	Gr. 3 566.37	566.37			
	Gr. 6 916.98	916.98			
	Gr. 8 161.82	161.82			
Enrichment masters				See description	
Duplicating supplies	Gr. 3 367.65	367.65			
	Gr. 6 377.16	377.16			
	Gr. 8 253.70	253.70			
Manipulatives and Calculators		See description			

Figure 2 continued

WORKSHEET FOR ESTIMATING COSTS

Facilities and Client Inputs

INGREDIENTS	TOTAL COSTS	COST TO DISTRICT	COST TO EXTERNAL FUNDING	CONTRIBUTED PRIVATE INPUTS	IMPOSED PRIVATE COSTS
Facilities					
Classrooms		See description			
Office space for site resource teachers		See description			
Storage space		See description			
Client Inputs					
Volunteers				See description	

Figure 3

PART FOUR

STAFF OPINIONS AND OBSERVATIONS OF IMPLEMENTATION

Prepared by

Dr. J. Richard Harsh

PART FOUR

STAFF OPINIONS AND OBSERVATIONS OF IMPLEMENTATION

I. Purpose and Design of Implementation Evaluation: Observations and User Opinion

The implementation evaluation was developed primarily to provide assurance that the content of the programs, as designed, was being used as specified by the curriculum writers or publishers. The description of each program specified the materials to be used and the classroom practices that should be included for regular instruction. These program descriptions provided a framework for organizing a systematic monitoring of the actual practices found in classrooms using the District Program and the four commercial programs.

The monitoring of the use of the programs for classroom instruction was designed to include visits to each of the 30 schools participating in the pilot. A random selection of classrooms within each school was made to cover all grades but concentrated visitation was directed to the third and sixth grades in which the pre and post testing of mathematics achievement was planned. School visits were unannounced to insure that the regular daily practices might be observed in each classroom. At the time of most school visits, interviews with the principal and resource staff of the school were included.

Data collected at each school site included logs, observation reports, progress charts, and school materials used in the mathematics program. The observation reports provided written descriptions of the materials and activities that were used; the classroom management and instructional procedures; and the teachers' comments, suggestions, and reactions to using the program with a particular class of children.

The monitoring of the implementation of these five programs was designed to obtain in-depth information throughout the school year. Thus, visits to schools using the various programs were made during the fall, winter, and spring months of the school year.

In the spring, a comprehensive questionnaire, The Math Survey, was distributed to site-personnel to obtain reactions of participants regarding specific strengths and weaknesses of the particular program piloted at each school. Both responses to structured questions and volunteered comments were obtained.

Since it was conceived that implementation evaluation should provide feedback and guidance for the program administrators, interim reports concerning the pilot were planned and provided to be used for on-going inservice and management.

The summary of the implementation evaluation provides an overview of the five mathematics programs that were piloted in a stratified sample of schools representing the range and diversity of schools within the district. The data obtained from school reports, interviews, The Math Survey, and class visitations provided documentation of both what and how various program materials and procedures were used as well as the observed reactions of teachers and students to the programs.

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II. Mathematics Programs Used in The Pilot

A. The Mathematics Programs

The mathematics programs nominated for the pilot study were:

1. Addison-Wesley: Mathematics In Our World (piloted in 6 elementary schools)
2. District Mathematics Program (piloted in 8 elementary and 2 junior high schools)
3. D. C. Heath: Heath Mathematics (piloted in 6 elementary schools)
4. McGraw-Hill: McGraw-Hill Mathematics (piloted in 1 junior high school)
5. Scott-Foresman: Scott-Foresman Mathematics (piloted in 6 elementary and 1 junior high school)

Each of these programs was subjected to rigorous review to determine whether each program included the contents and skills required by the California Curriculum Framework and the San Diego District goals and objectives for mathematics instruction. Each commercial publisher submitted materials and written documentation of the characteristics of the program and these were subsequently reviewed by the mathematics specialists designing the pilot study.

B. Program Materials

Each of the commercial publishers made available a variety of materials. Some programs had more extensive supplemental materials than were found in other programs. Moreover, the design of the pilot required that a comparable array of materials with a comparable range of costs be applied to all programs. At the outset, it was agreed that the approved list of materials for each program would provide an adequate basis for instruction and that all programs would include comparable materials for instruction.

The approved lists of pilot materials for the five programs were specified for each grade, Kindergarten through Grade 8. The lists specified whether copies were provided for each student, for each teacher, whether there were duplicating masters, and whether such items as Spanish editions were available, if needed. The complete lists are included in the appendix of this report.

It may be observed that the commercial programs provided consumable text book editions for Kindergarten-Grade 3 while hard-cover, non-consumable text books were used for Grades 4-8. Workbooks (consumable), although available from the commercial publishers, were more expensive than the amounts available for the pilots. As a result, the commercial programs provided one copy of the workbook or duplicating masters (or enrichment worksheet duplicating masters) which might be used for making copies for students as the teacher desired. In contrast, the District Program provided student worksheets for each student as well as the student booklet for the basic and advanced program at each grade for each student. All programs provided a Teacher's Guide or Teacher's Edition with suggestions for using the materials and instructions for organization.

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For the pilot, math manipulatives (i.e., blocks, centimeter rods, counters, bean sticks, etc.) whether made commercially or by the teacher or by students were approved for use with any of the programs. Commercially or district-produced materials (i.e., worksheets, tests, AGP materials, commercial workbooks) that were not on the approved list, however, were not to be used with any program.

C. Inservice Assistance

Each commercial program was presented and serviced by a Publisher Representative and the District Program was serviced by the Math Consultants of the district. To facillitate prompt identification of needs or problems experienced by teachers using the programs for the first time, a district person was designated to receive all questions and requests for assistance for each program. Thus, for example, one person received all requests and questions for the Addison-Wesley Program and these were in turn referred to the Publisher Representative, or to the district administration for response. The channeling of needs and problems through one person for each program developed a "needs assessment" that was useful for planning inservice assistance throughout the year.

Prior to the beginning of the fall semester, each program provided an inservice meeting for the staff of the schools using the program. The Publisher Representatives presented the inservice for the commercial programs and the Mathematics Consultants in the district presented the District Mathematics Program. During the year, each program was allowed to have three inservice meetings in addition to the direct response to requests from schools for specific information or missing materials.

Memoranda from The Educational Services Division and Evaluation Department of the district were augmented by two meetings for administrators of the schools participating in the pilot to provide up-to-date directions and guidance for the conduct of the pilot study.

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III. Observation of The Implementation of The Pilot Programs

The monitoring of implementation of the five mathematics programs in the thirty schools was designed to obtain in-depth information through unannounced visits to a random selection of classes in each school. The monitoring visits were planned to obtain information about the use of the program (1) during the fall (Oct.-Dec.), (2) the winter (Jan.-March), and (3) the spring (April and May). Data obtained during these three periods of the year were summarized to help in understanding both the conditions that were present as well as the manner in which the programs were implemented.

The unannounced visits to a sample of classes in all thirty schools participating in the pilot were made by three external evaluators and two members of the Evaluation Department. An observation reporting form was developed (a copy is entered in the Appendix) so that each observer visiting the classrooms could record the incidence of use of the materials of the pilot program and the use of various instructional procedures. During the school visits, the observers had discussions with the teachers and aides involved in the pilot as well as the principal and support staff that were involved in the mathematics pilot program. Each observer recorded the content of these discussions with the school staff and gave particular attention to the questions, satisfactions, or difficulties that were mentioned.

The observation reporting forms provided a means of recording the classroom structure for grouping, the instructional activities of teachers, aides, tutors and volunteers, the particular materials and techniques used with the students, and the over-all operation of the classroom. The wide range of activities, materials, and instructional procedures combined with variations of responsibilities of teachers and support staff in various classrooms did not allow meaningful discrete quantification of each element observed. For example, the use of certain materials with groups of students while other students were using other materials was highly related to the presence or absence of aides and other support personnel in the classroom. In addition, the classroom teacher's preference for instructional techniques and classroom management would commonly be related to the incidence and duration of use of many of the available materials.

The summarization of information recorded on the observation reporting forms was derived from the computation of frequencies of occurrence of the use of materials, instructional procedures, classroom practices, and reported comments. The summarization identified high frequency occurrences and practices for each program being piloted.* Such a summary also identified the absence of expected or planned activity as well as the unplanned or unexpected. The summarization of the monitoring of instructional practice observed during the visits to the classrooms may be most realistically characterized as the identification of common practices, trends, and operations.

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* The observation recording forms and observational narrative reports submitted by each observer are filed with the Evaluation Department along with the original survey answer sheets.

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A. Implementation, Fall of 1983

In all classrooms observed, the teachers were using the pilot textbook as the primary basis of instruction. However, there were inconsistent practices in the use of supplementary materials that were both approved and non-approved. In about half of the classrooms visited, the teachers were supplementing the pilot text with materials not on the approved list such as AGP or district worksheets and other materials that were not provided by the commercial publisher. Of course, all teachers were encouraged to use manipulatives such as blocks, counters, rulers, etc., with any of the pilot texts and such was commonly found particularly in the implementation of the pilots at the primary grades.

The commercial programs provided a full array of approved materials, but the student worksheets required continuous duplication (using the duplication masters provided) at each school site. The District Program, however, provided a full array of materials for students without duplication at the school site. During the fall, the time required to duplicate the commercial materials in the schools and the great amount of paper that was used were common concerns of many schools. Some schools reported that they did not have sufficient paper and in response to a special request the Board of Education approved a supplementary allotment to the pilot schools to purchase more paper for the duplication of worksheets and other supplementary materials through the year.

There was some evidence of inconsistent communication concerning the use of supplementary materials. Teachers tended to rely on what was available or what they had used previously to teach the objectives and concepts to students. Moreover, the materials that were known and more familiar to teachers were often preferred over new materials that had to be duplicated and used for the first time.

The school visits revealed that teachers piloting the new materials had additional questions concerning appropriate or inappropriate use of the program materials. While a person was designated as resource contact for all commercial programs, it was found that additional questions concerning procedures for working with the slow or gifted, pacing, record keeping, etc., needed additional inservice explanation.

The design and selection of schools for the pilot were made with great care to insure that comparable student populations were receiving mathematics instruction from each of the five programs. At the same time, during the visits, it was observed that some schools had more supplementary services

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which might have served to aid and abet the achievement in mathematics--such as computer labs, Title IV-C labs, Chapter 2 supplemental tutoring, basic skills resource teacher, etc. On the other hand, teachers in those schools with many "specially-funded services" often voiced their concern for the added paperwork and record keeping that consumed much of their time and/or the time of the instructional aide.

The visits to the sample of classrooms revealed variations in the organization and management of instruction both within and across programs. Teachers have developed skills and preferences for particular types of grouping, presentation of new concepts, applications, reinforcement, homework assignments, etc. Thus, within each of the pilot programs such variations in the instructional activities were observed even though all classrooms were using the same pilot text and program supplements. While the monitoring of implementation was primarily concerned with the use of the program materials and activities, it would be improper to fail to acknowledge the importance of the teacher in the presentation of instruction.

An interim report of the aforementioned information was presented to the district staff of the Educational Services Division and the Evaluation Department. A thorough discussion of the information collected during the first three months of implementation led to the following recommendations:

1. The Educational Services Division will prepare a detailed list of the acceptable materials to be used in each program at each grade.
2. The Educational Services Division will repeat instructions to schools about acceptable and unacceptable materials for the pilot classrooms.
3. The instructions will emphasize that materials on the approved list plus existing manipulatives are acceptable, while district worksheets or materials from another commercial program are not acceptable.
4. The instructions for acceptable and non-acceptable materials will be distributed and approved by all divisions having contact with the pilot schools.
5. The Mathematics Consultant from the Educational Services Division will schedule a meeting for principals of schools in the math pilots, the area superintendents, members of the Educational Services Division and Evaluation Department to advise them of the acceptable materials and to seek discussion regarding their views of the pilots.
6. An inservice meeting should be scheduled in January to answer teachers' questions about the use of the materials they are piloting and the list of acceptable materials.
7. Information from the Staff Development Needs Assessment will be provided to the publishers so they may plan inservice for teachers. Equal time will be provided for each program.
8. Classroom visitation will continue through May to ascertain the status of implementation of the pilots.

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The interim report and discussion that lead to the recommendation for further communications and inservice for the staffs of the pilot schools were felt to be exemplary practices to assure common understanding and implementation of the five programs. It should be noted that such an attempt to collect empirical performance data on a pilot test of materials had not been done previously.

Previous "pilots" have consisted of volunteer teachers using some materials (any way they wished) and then giving their opinions. Obviously, systematic process of evaluating the implementation as designed, used in this study, is difficult to accomplish and it is not surprising that people may have been unsure of the rules and criteria that were to have been used by all.

In response to the recommendations, the list of acceptable materials was developed and the suggested meetings were held to provide opportunity for repeated discussion of the rules for the pilots. The inservice meetings were conducted in January to provide further understanding and assistance to the teachers using the various programs. Following these meetings, each publisher was provided the opportunity to offer assistance to the teachers in the use of the program materials.

B. Implementation, Winter and Spring, 1984

The meeting on Jan. 12, 1984 of the operational staff and district administration was very useful in developing more detailed agreements concerning the use of materials and the design of the pilot study. On Jan. 31, 1984 a meeting of principals of schools in the pilot, Publishers' Representatives, and District staff provided excellent clarification for all parties concerned.

During the second and third rounds of visits to the pilot schools in the winter and spring of 1984, there was a noticeable increase in the principals' awareness of which materials were approved or not approved for use, and of the critical elements in the design and evaluation of the pilot. While the principals were informed and supportive of the recommendations of the Jan. 31, 1984 meeting, some teachers made candid comments to the observers that their first priority was doing "what would be most helpful for improving students' basic skills" regardless of whether the materials or procedures violated the design of the pilot study. As one teacher said, "After all, the children must come first and I'll do whatever I can to help them learn." Such reactions were not frequent, and the majority of teachers in the pilot verbalized and demonstrated their support for abiding by the design of the pilot.

In the spring (Feb. and March), the observers noted an increased concern on the part of teachers for the tests that would be administered by the District in all schools. In some instances this concern resulted in some modification of the schedule of weekly math activities and an increase in the review of particular concepts and operations. Some of the heightened concern for up-coming standardized testing was also reflected in the pattern of referrals and services of the Supplementary Instruction Program as well as the emphasis on Basic Skills given in the supplemental services provided by Chapter I or the Discretionary Funds. The variety of supplementary services in various schools appeared

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to have an effect on some classroom practices, especially as might be found in reteaching, sustained practice for mastery, or extension activities. When a math lab or resource teacher was readily available, some diagnostic, reteaching, or extension activities were used by these services outside the classroom, and this might have influenced the extent to which the teacher used the full range of materials that were available in a particular program.

During the winter and spring, unannounced visits were made to all thirty schools participating in the pilot. Although the visits were made to all grades, a majority of the visits were made to third and sixth grade classrooms since these were the levels at which test data were to be gathered for the study. More than sixty classrooms were visited during this period with most of the visiting observers remaining throughout the full period of math instruction for that day.

A summarization of the reports of the classroom visitations by the external evaluators provide evidence for the following characterizations of the pilot implementation:

1. All schools understood and supported the design of the pilot study. Following the Jan. 31, 1984 meeting there was a decrease in the observed use of non-approved materials in all programs and all schools.

2. During the early spring months (Feb. - March), there was increased attention given to using the array of materials provided by the pilot program. In the late spring (May) there was evidence of more intrusions and variations found during the time for math instruction.

3. Irrespective of intrusions, confounding supplementary services, or special math labs, each program whether commercial or District was the basic material of instruction in the pilot schools.

4. In general, the commercial program materials consistently used included the textbook (hard cover), duplicated drill sheets, unit tests, and reports to parents.

5. The reproduction of materials for all commercial programs continued to be perceived as a "burden" by teachers and aides. Even though schools were given additional allocations for reproduction, the process of duplicating from the masters was considered undesirable and often of less than satisfactory quality.

6. The record keeping procedures of the commercial programs were not generally perceived as "helpful" or "useful" by teachers. This was most common for the Heath and McGraw-Hill programs and to a lesser degree for the Addison-Wesley and Scott-Foresman programs.

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7. In general, the assessment and record keeping procedures of the commercial programs were seen as options rather than essential aspects of the program. In contrast, teachers using the District Program commonly reflected the attitude that the testing and record keeping were necessary elements of the program.

8. All commercial programs and the District Program received positive support from the majority of users. However, all programs had some defectors who believed the program to have undesirable faults or characteristics. For example, the majority of teachers felt that the Heath Program had ineffectual records and inadequate drill materials although many had praised the presentation of problems and the communication with parents.

9. All programs had accolades given by some teachers to the sequence and pacing of the instructional content for particular student populations. At the same time, all programs were criticized by other teachers for poor pacing for the slow or fast learning students. Some of the reaction to "pacing" and "introduction of new content" may be a reflection of ambivalence or different beliefs regarding approved or effective procedures for working with the very retarded or the accelerated or gifted learners.

10. Some teachers piloting the commercial programs perceived the inservice suggestions as so permissive (left up to the judgment of the teacher) that the materials were seen as options rather than important components to use with heterogeneous student populations.

11. Teachers using Addison-Wesley and Scott-Foresman reflected the highest enthusiasm for the content, organization, and illustrations of the textbooks. Several volunteered that these were the best textbooks they had used; and in these classes, there was a similar enthusiasm expressed by the students for the materials. The Heath and McGraw-Hill materials were not viewed with as complete enthusiasm although certain features were cited as excellent for the average or more-able learners.

12. The District Program was perceived differently from the commercial programs by most teachers. In this pilot most teachers, by attitude and action, reflected the perception that the District Program had an explicit design with recommended materials, activities, sequence, and pacing to be used. For example, each unit has a beginning, initial instruction, assessments, reteaching, extensions, tests of mastery, record keeping, etc., that are to be used. Thus, it may be concluded that the District Program presents a specific design, sequence, and pacing of instruction while the commercial programs primarily present materials that were variously used or unused.

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13. Observations of the instruction presented in the classrooms using the commercial programs provided evidence that there was much more variation of the use of the materials from classroom to classroom than there was among classes using the District Program. Teachers in the pilot reflected the explicit directions of District Program---"it's almost like having a script for each lesson." Thus, it might be concluded that there was more common use of all the District materials than of any of the supplementary materials in the commercial programs.

14. There was a strong impression that each teacher in using the commercial materials created his or her own program. For example, one teacher using Addison-Wesley confided that he jumped around throughout the textbook using the pages he felt met the needs of the students. A neighboring teacher expressed great satisfaction in using the book page by page because the sequence was so good. Some teachers in the primary grades expressed concern that they would finish the book by March or April while other teachers using the same material expressed concern for not being able to finish the book by the end of the year. In contrast, the District Program with its explicit sequence, and pacing tended to produce more common progress across all classrooms. As one junior high school principal expressed it, "I like the District Program because it keeps everyone in 'sync'---in other years I never knew where the students in the various classes were."

15. It appeared that the commercial materials were commonly seen by the pilot teachers as an excellent array for the teachers to use and orchestrate in their own design. The District Program was seen as a prescribed sequence of activities, materials, time and assessments that were to be followed by all teachers.

16. The teacher was seen as the prime determiner as to how instruction was organized and presented. The materials (whether they were textbooks, drill sheets, problems, assessments, illustrations, extensions, etc.) were vehicles for presenting various contents. Any of the material may have had adequate or inadequate presentation in relation to the preparation and characteristics of a particular student population. Accolades and complaints regarding the same materials used by several teachers in the pilot appeared to have been the result of the manner in which they were used with specific student populations.

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IV. Survey of Teachers' Reactions

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A. Data From the Complete Survey

In late spring, an extensive questionnaire, the Math Survey, was sent to all teachers who were participating in the math pilot. (A copy of the survey can be found in the appendix of this report.) The analysis of the responses to the survey was designed to observe the patterns of response of (a) teachers of various grades (K-3, 4-6, 7-8, etc.) and (b) teachers in schools with varying levels of achievement (high, average, low) as well as variations among teachers piloting each of the five programs. Tables A-G*, presented in the appendix, include all data produced by the automated scoring of the answer sheets. Attention is drawn to the fact that all respondents did not complete all "coding designations" and, thus, the particular grade taught by a teacher could not be identified beyond the knowledge that the respondent was in a K-6 school. Thus, all sub-analyses by grades or level of school achievement are accurate reflections of those respondents. However, in some cases the total number of respondents in K-6 schools was greater than the total of K-3 and 4-6 grades due to the aforementioned variation in coding.

Some of the questions had been included in the survey because of the special interest of administration and supervisory persons in the district and these questions were not necessarily of common relevance to all programs being piloted. As a result, some of these special interest questions were marked as not relevant by more than half of the respondents and responses were unevenly distributed among the programs.

The basic analysis of the survey was focused upon the contents and materials that were relevant to all programs and were relevant to all school populations. The questions that asked for teachers' appraisal of the appropriateness of the content and the effectiveness of the materials with various types of students were of prime interest. The teachers' ratings of the concepts, pacing, sequence, and over-all effectiveness of the programs being piloted were also of high interest to the evaluation of the implementation of the various programs.

The complete results from all surveys completed by the participants were summarized in the format of the questionnaire to enable a review of the number and percent of persons selecting each response. It was most gratifying to observe that 100% of the teachers (340 elementary teachers and 23 junior high school teachers) completed the questionnaire as well as nearly every resource teacher and administrator who was involved in the pilot use of the math programs.

B. Summary Data for Selected Survey Items

For the purposes of summarizing the trends of the survey data, several tables have been constructed to illustrate the findings presented in this report. Tables 1-11 present the percents of the respondents in various grades at the elementary and junior high schools who selected

*Numbers in the appendix tables may vary slightly from the numbers in the tables of the report due to some changes resulting from the re-scoring of the answer sheets to obtain responses from faint markings. In no instance are there significant changes in the patterns or overall distribution of responses to the questions. In general, the re-scoring had no effect on the percentage of responses for various options; and when there were changes, the changes were of only a few points.

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"high ratings" (a rating of "3" or "4" on the scale from "1" to "4") for the various items on the questionnaire. The greater percent of "high" ratings, the more positive was assumed to be the reactions of the teachers to the content and materials of the program they were piloting.

In interpreting the data from The Math Survey it is helpful to be aware of the variations in the numbers of respondents for each program. These wide variations made certain statistical analyses of significance, inappropriate. Here are those data:

Groupings of Respondents	Number of Respondents for Each Program				
	A-W	District	Heath	H-H	S-F
K - Gr. 3 Gr. 4 - Gr. 6	55 36	66 37	37 30		36 25
K - Gr. 6	99	111	72		68
Gr. 7 - Gr. 8	--	13	--	5	5
Totals	99	124	72	5	73

A review of the data presented in these tables provides a detailed overview of the reactions of the participants which was generally positive and supportive of the pilot efforts. The following discussions attempt to identify the trends and tendencies that appeared to emerge from the data:

1. Elementary School Teachers' Responses

The elementary trachers responding to the survey tended to perceive the program they were piloting in a generally positive manner. Table 1 presents the percents of respondents selecting high ratings ("3" or "4" on the 4-point scale) concerning the content and effectiveness (e.g., initial instruction, drill, problem solving, maintenance, reteaching, enrichment, and reinforcement) of the materials. The data reveal the generally strong and positive attitudes expressed for the commercial programs and the District Program. This finding provides some assurance that the teachers piloting the various programs were positive and enthusiastic toward using the materials of the programs. This also provides an indication that a positive attitude toward mathematics instruction was reflected in the pilot classrooms.

The item that asked for the teachers' appraisal of the appropriateness of the content for slow, average, and fast-learning students in Kindergarten through Gr. 6 showed the Scott-Foresman program to have the lowest rating for slow-learning students while the District Program was least favorably perceived for fast-learning students.

There was very comparable appraisal of the adequacy of coverage of the concepts and initial instruction across all programs. On the other hand, the Heath Program was least favorably perceived for the coverage and concepts of problem solving. The lesser effectiveness of the Heath Program for presenting problem solving was also noted in a separate question regarding the various aspects of the program materials.

The effectiveness of the programs for reteaching, enrichment, and reinforcement revealed the highest ratings being given to Addison-Wesley while the lowest were given to Scott-Foresman.

In all schools piloting the programs in Kindergarten through Grade 6, teachers responding to the request to compare the pilot program they were using to programs they had used previously revealed the highest rating for D. C. Heath (89%), followed by Addison-Wesley (69%), District (66%), and Scott-Foresman (39%). In a similar question, the teachers were asked to indicate how well they thought they were able to provide the full range of desirable instruction with the program they were piloting. In this case, 70% of the District Program teachers gave the highest ratings, followed by 64% for Addison-Wesley, 54% for D. C. Heath, and 42% for Scott-Foresman.

For these "content and effectiveness" items, Addison-Wesley received the greatest percent of high ratings for 8 of the 16 items; the District Program for 6 items, and Heath for 2 items. Scott-Foresman did not receive the greatest percent of high ratings for any item. At the other end of the scale, Scott-Foresman had the lowest percent of high ratings for 9 of the 16 items; Heath for 5 items; Addison-Wesley and the District Program each received the lowest for only one item. These data reflect the fact that although each program received some very high ratings, each program also received some very low ratings. For example, the D. C. Heath program was least effectively perceived for presenting problem solving, while it was given the highest ratings for content appropriate for average and for fast learning students.

A further summarization of the Elementary School respondents' ratings of these selected items on the Math Survey was made by computing a median percentile for each pilot program. At the bottom of Table 1 the medians are presented for each program. These medians suggest the central tendency of the respondents' ratings while the separate ratings for each item reflect the respondents' reactions to the particular content or aspect of the program. The median percents are highly similar although Addison-Wesley had the highest and Scott-Foresman the lowest central tendency of rating.

These results described above reflect the ratings of all teachers in Kindergarten - Grade 6 in all schools and with all types of students.

When the responses were summarized in terms of low, average, and high achieving schools, (Table 2), wide differences were noted for each program according to the typical achievement of the school. For example, Addison-Wesley had the highest median rating in low achieving schools while Scott-Foresman received the lowest median rating in such

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schools. In contrast, Scott-Foresman received the highest median ratings in average and high achieving schools while Addison-Wesley received the lowest median ratings in average achieving schools. Heath received the lowest median rating in high achieving schools. Of course, these medians of 16 items concerning the effectiveness of the materials mask even greater differences expressed by the respondents in relation to individual elements of the program materials. The reader is encouraged to review this variation in teachers' perceptions in low, average, and high achieving schools in Table 2.

When the respondents were subdivided into K-Gr. 3 and Grades 4-6 levels (Tables 3 and 4), there were many differences between the two groups in their reactions to the appropriateness and effectiveness of the material for slow, average, and fast-moving students. Indeed, there were such complete arrays of high and low ratings for each level and type of student that no simple conclusion regarding any program was possible. For example, the Addison-Wesley program was rated as the most appropriate content for slow-learning students by quite different patterns of responses by lower grade and upper grade teachers. The same was true in responses regarding fast-learning students.

The median percents of high ratings for Kindergarten through Grade 3 and for Grades 4 through Grade 6 in low, average, and high achieving schools are presented in Tables 3 and 4. Again, the variation among teachers at different grades and among low, average, and high achieving schools may be observed. For example, Addison-Wesley received the highest median rating from K-3 teachers in high achieving schools and the lowest median rating from 4-6 teachers in high achieving schools. As another example, Scott-Foresman received the highest median rating from Grade 4 through Grade 6 teachers in high achieving schools while receiving the lowest rating from K-3 and 4-6 teachers in low achieving schools. Similar variations may be observed for all programs.

Several other illustrations dramatize these differences of lower and upper grade teachers' ratings of the content and effectiveness of the materials for slow, average, and fast-learning students. For example, only 41% of the K-Gr. 3 teachers gave the District Program the highest ratings for advanced concepts in low-achieving schools. In contrast, 91% of the Grades 4-6 teachers in the same schools gave high ratings to advanced concepts in the District Program.

The survey included the question as to whether or not each piloted program should be recommended for district-wide adoption. The question was answered "Yes" or "No" and, therefore, could not be analyzed with items answered on a 4-point rating scale. The recommendations of the respondents are presented in Table 5. When the respondents to all grades and achievement levels were combined, Addison-Wesley and Heath were recommended by the highest percents (79% for each program) of respondents. Next was the District (68%), and last, Scott-Foresman (65%).

The variation of ratings given by those responding to questions asking for general, over-all appraisals suggests that different and unidentified criteria may have been operating in the several questions.

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TABLE 1

Percent of Respondents from Elementary Schools
Choosing High Ratings for Selected Items on the Math Survey

Selected Items	Percent of Respondents Selecting High Ratings*			
	A-W	D	H	S-Y
Is math content appropriate for: —slow learning students	65%	63%	60%	54%
—average learning students	82	86	89	86
—fast learning students	74	67	76	74
Was there adequate coverage for concept development in: —initial instructional material	84	85	80	76
—problem solving	78	84	63	76
How would you rate the effectiveness of the material for: —initial instructional material	85	86	81	76
—drill and practice	73	84	81	71
—problem solving	82	83	62	68
—skill maintenance	86	77	77	76
—reteaching	80	78	69	62
—enrichment/extension	87	75	78	59
—reinforcement	86	78	76	52
How would you rate the program's relation to: —advanced concepts	69	67	58	60
—pacing	67	61	59	60
—sequence of material	78	76	74	76
—record keeping	76	85	75	60
Median	79	78	76	70

*A 4-point rating scale was used. Ratings of 3 and 4 have been combined and interpreted as "high" ratings for this summary table.

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TABLE 2

Percent of Respondents from Low, Average & High Achieving Elementary Schools, Choosing High Ratings for Selected Items on the Math Survey

Selected Items	Percent* of Respondents Selecting High Ratings**											
	In Low Achieving Schools				In Average Achieving Schools				In High Achieving Schools			
	A-W	D	H	S-F	A-W	D	H	S-F	A-W	D	H	S-F
Is math content appropriate for: —slow learning students	72%	40%	72%	35%	66%	71%	64%	73%	55%	78%	51%	66%
—average learning students	83	73	92	70	88	95	87	100	76	96	88	100
—fast learning students	83	76	78	66	55	71	82	69	84	48	72	84
Was there adequate coverage for concept development in: —initial instructional material	85	81	79	62	82	88	82	93	81	87	80	83
—problem solving	86	84	72	62	69	85	54	86	75	77	67	89
How would you rate the effectiveness of the material for: —initial instructional material	90	83	86	59	86	90	73	94	78	82	83	89
—drill and practice	80	77	93	55	49	98	72	82	81	78	79	89
—problem solving	79	80	57	49	71	84	59	86	89	82	66	84
—skill maintenance	93	68	93	72	67	80	64	81	86	78	77	84
—reteaching	75	78	58	44	84	79	64	75	81	73	74	78
—enrichment/extension	95	71	86	35	75	77	73	62	89	78	76	95
—reinforcement	90	69	93	35	84	81	57	57	83	87	79	77
How would you rate the program in relation to: —advanced concepts	66	59	50	39	63	80	64	100	77	65	57	63
—pacing	82	61	50	35	57	63	59	81	61	57	60	84
—sequence of material	90	71	72	64	60	89	82	87	78	61	69	90
—record keeping	72	94	65	37	79	81	68	94	72	91	83	74
Median	83	75	75	52	70	81	66	84	80	78	75	84

*Some of these percents are based on very small numbers and, therefore, must be interpreted with caution. The "N" for each category can be found in Tables A-D in the appendix.

**A 4-point rating scale was used. Ratings of 3 and 4 have been combined and interpreted as "high" for this summary table.

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TABLE 3

Percent of Respondents, Kindergarten through Grade 3, Choosing High Ratings for Selected Items on the Math Survey

Selected Items	Percent* of Respondents Selecting High Ratings**											
	In Low Achieving Schools				In Average Achieving Schools				In High Achieving Schools			
	A-W	D	H	S-F	A-W	D	H	S-F	A-W	D	H	S-F
Is math content appropriate for:												
—slow learning students	86%	52%	76%	38%	61%	73%	59%	63%	71%	83%	65%	60%
—average learning students	86	64	88	63	78	95	75	100	100	84	94	100
—fast learning students	78	67	63	62	50	74	75	76	86	58	65	90
Was there adequate coverage for concept development in:												
—initial instructional material	84	80	63	60	73	96	92	100	100	77	88	78
—problem solving	79	74	75	44	72	86	58	88	81	77	50	89
How would you rate the effectiveness of the material for:												
—initial instructional material	93	90	88	50	83	91	91	100	96	83	88	90
—drill and practice	86	69	88	56	42	96	75	88	91	92	87	77
—problem solving	79	69	51	32	77	91	50	88	100	83	59	78
—skill maintenance	100	62	88	69	59	91	58	88	95	84	82	78
—reteaching	72	72	63	44	94	76	84	63	95	83	76	78
—enrichment/extension	86	62	76	25	77	82	83	51	90	92	75	100
—reinforcement	93	58	88	31	89	82	75	38	100	85	88	76
How would you rate the program in relation to:												
—advanced concepts	57	41	26	18	65	86	59	100	75	46	50	66
—pacing	86	57	25	29	42	57	66	66	80	69	59	89
—sequence of material	100	60	88	70	59	91	91	100	86	69	77	90
—record keeping	72	79	63	57	71	91	72	100	62	85	76	60
Median	86	66	76	47	72	89	75	88	91	83	76	78

*Some of these percents are based on very small numbers and, therefore, must be interpreted with caution. The "N" for each category can be found in Tables A-D in the appendix.

**A 4-point rating scale was used. Ratings of 3 and 4 have been combined and interpreted as "high" for this summary table.

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TABLE 4

Percent of Respondents, Grades 4 through 6.
Choosing High Rating for Selected Items on the Math Survey

Selected Items	Percent* of Respondents Selecting High Ratings**											
	In Low Achieving Schools				In Average Achieving Schools				In High Achieving Schools			
	A-W	D	E	S-T	A-W	D	E	S-T	A-W	D	E	S-T
Is math content appropriate for: --slow learning students	50%	27%	67%	33%	69%	69%	72%	75%	23%	70%	26%	50%
--average learning students	81	90	100	85	100	94	100	100	41	90	82	100
--fast learning students	91	91	100	69	59	67	86	60	92	40	76	100
--initial instructional material	90	90	100	69	92	81	86	80	46	90	70	100
--problem solving	100	100	67	84	61	88	43	80	58	78	83	84
--initial instructional material	82	75	84	75	92	87	71	80	46	80	77	100
--drill and practice	72	90	100	59	54	100	86	60	62	70	70	100
--problem solving	72	100	66	75	61	86	72	80	69	90	71	84
--skill maintenance	90	82	100	75	72	79	86	80	84	80	70	100
--reteaching	91	82	50	50	69	86	43	80	61	70	71	67
--enrichment/extension	100	82	100	50	69	80	71	80	85	70	76	100
--reinforcement	90	83	100	42	76	80	33	80	61	90	69	67
--advanced concepts	63	91	83	69	64	85	71	100	84	90	53	84
--pacing	82	75	83	46	72	76	71	100	31	40	59	100
--sequence of material	72	82	50	58	58	92	86	60	54	50	64	100
--record keeping	63	75	67	16	93	70	86	80	77	90	88	100
Median	82	83	84	64	69	83	72	80	61	79	71	100

*Some of these percents are based on very small numbers and, therefore, must be interpreted with caution. The "N" for each category can be found in Tables A-D in the appendix.
**A 4-point rating scale was used. Ratings of 3 and 4 have been combined and interepreted as "high" for this summary table.

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TABLE 5

Percents of Elementary Teachers
Responding to Questions About the Total Program

Program	Percents of Teachers Recommending Adoption of Each Program									
	K-Gr.3			Gr. 4-6			K-Gr.6			
	Achievement Level			Achievement Level			Achievement Level			
	High	Avg.	Low	High	Avg.	Low	High	Avg.	Low	Combined
Addison-Wesley	90%	53%	100%	67%	69%	67%	83%	60%	92%	79%
District	67	80	54	80	55	80	74	73	60	68
Heath	100	73	71	64	71	83	83	71	77	79
Scott, Foresman	100	89	42	100	20	43	87	69	45	65
	Percent of Teachers Giving High Ratings to being able to provide the full range of desirable instruction with the pilot program									
	K-Gr.3			Gr. 4-6			K-Gr.6			
	Achievement Level			Achievement Level			Achievement Level			
	High	Avg.	Low	High	Avg.	Low	High	Avg.	Low	Combined
Addison-Wesley	77%	56%	76%	55%	61%	25%	60%	60%	61%	64%
District	68	75	75	30	75	66	60	76	77	70
Heath	50	50	67	50	29	54	50	43	61	54
Scott, Foresman	23	55	43	55	40	40	35	44	40	42
	Percent of Teachers Giving High Ratings to the pilot program compared to previously used program									
	K-Gr.3			Gr. 4-6			K-Gr.6			
	Achievement Level			Achievement Level			Achievement Level			
	High	Avg.	Low	High	Avg.	Low	High	Avg.	Low	Combined
Addison-Wesley	86%	50%	85%	66%	69%	42%	73%	58%	71%	69%
District	46	85	66	60	59	90	52	74	78	66
Heath	85	92	100	84	86	87	84	81	94	89
Scott, Foresman	23	55	43	55	40	40	35	44	40	39

2. Junior High School Teachers' Responses

In the junior high schools the McGraw-Hill, Scott-Foresman, and District programs were being piloted. The percents of respondents selecting high ratings for each question of the survey are presented in Table 6. The appropriateness of math content for slow-learning students revealed the highest rating (77%) given to the District program with relatively low ratings (20% and 40%) for the two commercial programs. In contrast, the math content for fast-learning students was judged to be highest for the Scott-Foresman program (60%) and lowest for the District program (46%). The least amount of variation of reaction was shown for the ratings of the appropriateness of content for average-learning students.

Junior high school teachers' ratings of the effectiveness of the materials of the three programs tended to be generally high for all aspects of instruction. However, McGraw-Hill received very low ratings for initial instruction, drill and practice, and reteaching while this program received the highest ratings for enrichment and reinforcement.

Of some interest was the fact that the lowest (40%-59%) overall ratings were given to the advanced concepts presented by the materials.

The median percents of high ratings for selected items of program content provided by the junior high school teachers (Table 6) revealed the highest ratings for Scott-Foresman and the lowest for McGraw-Hill. These ratings of selected aspects of the math programs also showed extreme variations from item to item and also reflected variations from the overall ratings presented in Table 7. It may be observed from the data presented in Table 7 that the junior high school teachers gave the highest recommendation for adoption to the District Program and also gave the highest ratings to the District Program for providing a full range of instruction.

When junior high school teachers were asked the extent to which they were able to provide the full range of instruction during the pilot, the District received the highest rating (81%) while McGraw-Hill received the lowest (33%) (Table 7).

The teachers were asked to compare the program they were piloting with other programs or materials. Scott-Foresman was rated as more effective than other programs by 100% of those using the Scott-Foresman during the pilot. Sixty percent (60%) of those using the District program rated it better than other programs and materials, while only 33% of those using McGraw-Hill felt it was superior to other programs. The question on the survey that asked respondents to compare the pilot program they were using with other math programs and materials they had used did not provide opportunity to identify what programs were being compared. Thus, it would be improper to interpret the respondents' reactions as reflections of comparison with each or any of the other programs in the pilot. This response (question 68 on the survey) is a reflection of how the program was perceived by the teacher in comparison with previous materials or programs each teacher had used.

When asked whether or not the program being piloted should be recommended for district-wide adoption, the highest percent (90%) saying "Yes" was the group piloting the District Program. (See Table 7.) In interpreting the responses to the various questions, it is important, however, to remember at least two points: (a) the numbers of respondents for each program are very small (District=13, McGraw-Hill=5, and Scott-Foresman=5), and (b) there are wide variations in the responses to almost all items by the groups piloting each program.

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TABLE 6

Percent of Respondents from Junior High Schools
Choosing High Ratings for Selected Items on the Math Survey

Selected Items	Percent of Respondents Selecting High Ratings*		
	S	McG-H	S-F
Is math content appropriate for: —slow learning students	77%	40%	20%
—average learning students	92	80	100
—fast learning students	46	60	80
Was there adequate coverage for concept development in: —initial instructional material	77	40	100
—problem solving	85	60	100
How would you rate the effectiveness of the material for: —initial instructional material	69	40	100
—drill and practice	76	40	80
—problem solving	85	60	80
—skill maintenance	92	80	80
—reteaching	69	20	80
—enrichment/extension	69	100	60
—reinforcement	61	80	60
How would you rate the program in relation to: —advanced concepts	59	50	40
—pacing	83	50	100
—sequence of material	91	50	80
—record keeping	67	0	80
Median	77	50	80

Note: Caution is needed in interpreting these data because of the small numbers of respondents: District = 13, McGraw-Hill = 5, and Scott, Foresman = 5.

*A 4-point rating scale was used. Ratings of 3 and 4 have been combined and interpreted as "high" ratings for this summary table.

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TABLE 7

Percents of Junior High Teachers
Responding to Questions About the Total Program

Program	Percent Recommending Adoption
District Program	90%
McGraw-Hill	67%
Scott, Foresman	75%
	Percent Giving High Ratings to being able to provide the full range of instruction
District Program	81%
McGraw-Hill	50%
Scott, Foresman	33%
	Percent Giving High Ratings to the pilot program compared to previously used programs
District Program	60%
McGraw-Hill	100%
Scott, Foresman	33%

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3. Responses to Items Related to Inservice

A part of the plan for implementation of the pilot programs was planned inservice education to assist teachers in using the new program and materials. Each of the programs being piloted had an inservice meeting prior to the beginning of the school instruction and then had follow-up meetings during the year in response to questions or problems identified by the first use of the materials. A person was designated as a program contact for each program for all schools to submit requests for materials or procedures that were needed. The contact person communicated school requests to the Commercial or District Program administrator. By design, each program was to offer the same amount of inservice assistance to the schools using that program, and no program was to provide any less or any more assistance to teachers than any other program.

The survey asked for teachers' reactions to the inservice provided to assist them in implementing the program they were piloting. The responses to the survey items dealing with inservice are presented in Tables H and I of the appendix. The elementary teachers gave the highest ratings to the Addison-Wesley inservice while the least assistance was reported for the Scott-Foresman inservice. The McGraw-Hill inservice received the highest rating among junior high school teachers while the Scott-Foresman received generally low ratings (20%-50%) for all aspects of assistance.

4. Responses to Items Related to Support Services

The procedures for implementing various activities in mathematics instruction are often aided by support personnel or special school facilities. Indeed, the math pilot was being conducted in schools that had a variety of other programs and services as well as in schools that did not have such services or facilities. Thus, it was deemed advisable to determine whether schools piloting the different programs had comparable services and facilities.

Several questions on the survey asked teachers to rate the impact of instructional aides, volunteer tutors, math labs, Basic Skills Supplementary Assistances, computer assisted instruction, and on-site resource teachers' services. The complete record of responses to these items on the survey are presented in Tables J and K of the appendix. These survey questions were concerned with whether the various services were available as well as whether the teachers felt that such supplementary facilities and services had impact on classroom instruction. The overall results suggest that the Basic Skills Supplementary Assistance and instructional aides were most commonly available in all schools and received the highest ratings for impact on the instructional program.

The results of these survey questions concerning availability and impact of services suggest that all pilot programs had a comparable array of services available and the teachers felt that the impact of the services was quite comparable with the various programs. In effect the data do not suggest that any program had an advantage by having greater availability of supplementary services in the elementary schools.

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C. Teachers' Spontaneous Comments

In addition to responding on the rating scales of the survey, the teachers were encouraged to write spontaneous comments concerning the advantages and disadvantages of the program they were piloting. A compilation of these comments has been prepared and is available as a reference for the Programs Division of the district.

These spontaneous comments concerning each of the programs were summarized for teachers in the lower grades (Kindergarten - Grade 3), the upper grades (4th - 6th grades), and junior high school. In addition, the comments were separated into groups of teachers in the low, average, and high achieving schools. This analysis of these comments provided an additional opportunity to look for variations in reactions by the level of teaching as well as in terms of the academic achievement of the student population.

Since more than one thousand comments were submitted by the teachers responding to the survey, there was a very broad range of topics and details mentioned. Perhaps of most importance was the observation that an identical element such as "pacing" or "drill sheets" would be submitted by one person as a strong advantage and would be listed by another person at the same grade or type of school as a serious disadvantage of the program. These contradictory appraisals of the programs were found among all of the commercial programs as well as the District Program. Thus, any one reading this report may disagree with a trend observed due to the fact that other persons may have previously voiced an opposing point of view regarding the materials or structure or content of a particular program. The following summary of common advantages and disadvantages of the programs mentions only those contents or procedures that were mentioned by several respondents. Moreover, there is an attempt made to reflect the predominant themes and attitudes reflected by the teachers' comments.

1. Addison-Wesley Program

Of all the commercial programs, the Addison-Wesley program received the most enthusiastic endorsement. It was perceived as an excellent program among teachers at all elementary grades and within schools characterized as having high, average, and low academic achievement. Teachers expressed appreciation for the excellence of structure, sequence, pacing, format, and variety of materials. The presentation of concepts, problem solving, and enrichment was characterized as excellent. There was strong agreement that there was a wealth of supplementary material of high quality with bright and interesting pages that were interesting and motivating for students.

Those that mentioned disadvantages tended to mention the extra work caused by having to make copies of the materials from the masters. There was a small proportion of teachers that felt the pacing was too fast or the problems were too difficult for the slower learners. This comment was mentioned by teachers in schools of high, average,

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and low achievement; but there was a preponderance of teachers in these same schools that disagreed and felt that the content and pacing were excellent.

The extremely positive support is reflected by comments such as: "This is the most superior program I have used or seen"; "Pacing allows all children to understand concepts . . . "the bright pages motivate . . . the support materials and concepts are clearly taught"; "I have no disadvantages . . . I love it and the children feel great about it"; and "The materials and presentations are excellent."

2. D. C. Heath Program

This program had a preponderance of comments citing the quality and excellence of the program. Major trends were the mention of good sequencing, problem solving, pacing, home communication with excellent enrichment materials. The comments reflected appreciation for the teacher's guide, the record keeping, and the motivational quality of the presentations to students.

The disadvantages tended to revolve around the duplication of materials and the need for more practice and drill sheets. It was also felt that the program did not provide enough inservice assistance to the teachers so they could more adequately provide for the range of learning speeds in the classrooms.

As was the case with all programs, there were completely opposed opinions regarding pacing ("pacing too slow" and "moves too fast for children to learn concepts") and the amount of material ("plenty of material for all"; and "I ran out of material during the 4th quarter").

The very positive attitude toward this program was only tempered by a smaller group that saw the need for more material for the faster students and more practice materials and slower pacing for the slower students.

3. District Program

The District Program received the most extensive and detailed comments of support and approval. The common accolade was reflected by the comment, "Thorough sequential development of concepts with all around excellent materials, simple record keeping and . . . all materials were provided." The comment, " . . . well organized, good warm-up ideas with well structured suggestions for instruction in a systematic sequence" also captured the theme that this program was, indeed, a program and not just an array of materials.

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In all types of schools (high, average, or low achieving) the teachers mentioned the direction and guidance that was provided for their instruction. This was reflected by the comment, "It keeps you on track and insures coverage of all mathematics for the year" or "All materials are available and the program is so well structured that it keeps you on track and the teacher knows exactly what should be taught."

The teachers also commented that they observed that students were making more progress than with previous programs and that it was, " . . . excellent materials and strategies for teaching all levels of students."

At the same time it must be noted that a smaller proportion of teachers felt that the program was, " . . . cumbersome with too much paper, too structured for multi-groups in a class", and that there wasn't enough time to cover all the material with the pacing that was either too slow for fast or too fast for slow-learning students. Indeed, there were several comments that suggested that the materials needed to be in a more compact form and that the pacing and sequence of division and measurement should be revised. A few comments expressed extremely negative feelings, " . . . entire program is too cumbersome . . . teacher information is like a script"; " . . . many mistakes and don't know why the district insists when we don't have the manpower or money to do it well." As mentioned with other programs, every aspect mentioned by some as a disadvantage was contradicted by other teachers' comments that expressed appreciation for the excellence of that same content or condition.

The support of this program is well reflected by the comments, "This is the best program I've seen . . . all the materials are provided . . . there is a wealth of ideas for concept development . . . student success is high. . . . It's an excellent program that has made me a better teacher of math"; "Now I'm familiar with this program and I'll do a better job next year in pacing the use of all the excellent materials." Finally the guidance and contribution of the program is reflected by the comment, "I have found the worksheets clear and straight forward. This is a great help to slower children and the more able find it easy and rewarding to help the children who haven't grasped the idea yet. I've never felt, in almost 30 years of teaching in the primary grades that teaching math was my forte. I do now! I love it!!!"

The unique aspect of the comments regarding the District Program was the recognition shown by the preponderance of positive accolades as well as the less frequent complaints that this was a suggested program of instruction that was to be presented with warm-up and extension. The comments regarding the commercial programs, however, reflected the variable use of and reaction to an array of materials that were provided by each program.

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4. McGraw-Hill Program

This program was piloted only in the junior high schools and too few comments were volunteered regarding it to warrant inclusion in this summary.

5. Scott-Foresman Program

This program produced a smaller volume of spontaneous comments than the other programs being piloted. While the majority of comments gave support to the good sequence, format, testing, and support materials for reteaching, there were an almost equal number of comments that pointed out the disadvantages of not enough drill sheets and the necessity of extensive copying of materials.

The teachers also mentioned that there were many errors in the guide and in the materials to be used with students as well as errors in the teacher's guide in directing the use of the other materials.

A number of positive comments regarding the testing and format of the materials were offset by frequent comments regarding the lack of support through inservice and the inadequate amount of practice materials. The over-all impression was that although there was positive support by teachers piloting the program, this program was the least positively perceived of the various programs piloted during the past year.

These spontaneous comments made by the teachers piloting the programs have added significance to the external evaluators who visited a large proportion of these classrooms during the fall, winter, and spring of the past year. Observations made during classroom visits revealed a very wide array of uses of the same program materials in various classrooms. The organization and management of the classroom was a direct reflection of the teachers' preferences, expertise, and experience. Thus, materials were often used with different pacing and sequence and the strategies for introduction, initial instruction, assessment, and reteaching were also most varied. Thus, the diversity of teacher opinion regarding the effectiveness of the programs and the materials may be significantly influenced by the manner in which the instruction was structured and the manner in which the materials were utilized.

In spite of the opposing views of various teachers concerning particular contents or characteristics of each of the programs, it is salutory to note that the preponderant response to each program was positive and supporting. This finding suggests that the implementation of the pilot was made by teachers who were enthusiastic rathar than negative about the use of the new program and were interested in having students succeed with the math instruction. The spontaneous comments also reinforce the observation during visits to the classrooms that the first use of any new program presents problems that will be resolved by greater familiarity with the material and the selection of strategies that are most effective within the teacher's style of organization and management of the classroom.

V. Summary and Conclusions Regarding Implementation of Four Commercial Programs and The District-Developed Program for Mathematics

A. An Overview

This summary of the pilot implementation of the five mathematics programs is derived from (1) the unannounced visits to 103 classrooms in the thirty participating schools during the fall, winter, and spring of 1984; (2) the responses of all participating teachers and members of the schools' staffs to a survey of reaction to the programs being piloted; (3) spontaneous comments on the survey form from participating teachers regarding "advantages" and "disadvantages" of the program piloted by each respondent; and (4) interviews with administrators and staff of the thirty schools participating in the pilot.

The design of the pilot study provided an opportunity to systematically observe the pilot use of the mathematics programs in a representative sample of schools reflecting school populations with generally low, average, and high academic attainment with comparable demographic characteristics. Such a diverse sample of schools afforded opportunity to study the use of the several programs in different but highly comparable contexts and conditions. It is important to recognize that the particular program used by each school was the choice of the staff of that school and not an arbitrary external decision.

The purpose of the implementation evaluation was to determine the extent to which each program was being used as planned and intended by the publishers and developers of the programs. The materials for each program approved for use in the pilot are presented in the appendix of this report. The approved materials were judged to provide an adequate and comparable basis for mathematics instruction.

Three hundred and sixty-one teachers and their classes in thirty schools participated in the pilot use of the five mathematics programs. A high percent of the teachers in each of the four commercial programs as well as the District Program expressed enthusiastic support or a generally positive attitude for the program they were using. This finding made from observations during visits as well as the results of the survey of teachers' opinions provided assurance that the teachers using each program had positive attitudes toward using the materials of the program. There was no evidence found to indicate that any program was initially perceived in a significantly different manner.

The basic and continuous instruction in each of the programs utilized the materials of that program. While there was variation among teachers in the frequency and manner of using the full array of materials of the program, the basic material, such as the textbook for a commercial program, was the consistent basis for instruction. The four comercial programs tended to have less use of the full array of supplementary materials than was found in the implementation of the District Program.

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The commercial programs had many optional components and materials and the publishers' representatives in the inservice meetings tended to encourage the teachers to use and orchestrate the materials in the manner that best fit their classes. Thus, implementation reflected less teacher attention or concern for the lessons outlined in the teacher's edition of the materials than was found in the District Program.

The greatest differences in program implementation were found between the District Program and the commercial programs. The District Program was commonly perceived and implemented as a prescribed plan of instruction with a designated sequence of activities, materials, time of usage, assessments, and record keeping that were to be followed by all teachers. It was concluded that there was a greater amount of variation in the use of commercial materials by the teachers piloting those programs than was observed among the teachers piloting the District Program.

B. The Addison-Wesley Program

The Addison-Wesley program received the most enthusiastic spontaneous comments on the survey form of all the commercial programs. It was characterized as having excellent presentations, structure, format, and variety of materials within schools of low, average, and high academic achievement. Teachers expressed satisfaction with the wealth of supplementary materials and the bright and interesting pages that were interesting and motivating for students. The fairly common disadvantage of Addison-Wesley was the extra work caused by having to duplicate materials from the masters. There were contradictory feelings about the "pacing" with some mentioning the too-fast-pace while others thought it was just right and insured that everyone understood the concepts presented. The highest rating among all the commercial programs was given to Addison-Wesley for the effectiveness of the program for reteaching, enrichment, and reinforcement. However, as mentioned previously, there were conflicting evaluations given by teachers in the K-Gr. 3 and Gr. 4-6 and in low and high achieving schools concerning such things as initial instructional material, and the appropriateness of content. Seventy-nine percent (79%) of the teachers using Addison-Wesley said they would recommend the program for district adoption.

C. The District Program

The District Program received the most extensive and detailed spontaneous comments of approval and support. The thorough and complete structure with excellent materials that were all available were the common themes of approval. In addition, it was seen as providing complete guidance. For example, "All materials are available and the program is so well structured that it keeps you on track and the teacher knows exactly what should be taught." However, these elements of advantage were cited by other teachers as negative aspects of the District Program. Thus, as is the case of all of the programs piloted, there were strong and opposing views of the program which seem to relate the experience, philosophy, and teaching style of the teacher piloting the program. While there was clearly no unanimous opinion among the users of any of the commercial programs, or the District Program, the predominent support for the District Program seemed clear.

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As a result of the visitations to the classes throughout the year, the external observers believed that the most noticeable differences in implementation were found between the District Program and the commercial programs. Some of these differences would appear to suggest enhanced instruction and student achievement for those schools using the District Program. As mentioned previously, the District Program specified the sequence, time, and use of all materials and activities. This program structure appeared to have resulted in the following:

1. more student time on tasks presented during math period.
2. more consistent use of a variety of activities (warm up, drill, and practice)
3. more accountability (class test record wall-chart posted, and repeated testing continued until mastery attained)
4. more direct instruction
5. homework built into each lesson for reinforcement
6. more manipulatives and variety of strategies for concept development

In addition, the explicit specifications of each lesson also appeared to have resulted in:

1. more preparation required of teachers
2. more problems with pacing for teachers
3. less diagnostic approach (e.g., total test scores vs. skill breakdown)
4. some confusion regarding translating criteria for mastery into letter grades
5. more complaints about the program being too easy or too repetitious for some students.

D. The McGraw-Hill Program

The McGraw-Hill program was used only at the junior high school level and, while it was cited as excellent for enrichment and reinforcement, it was rated considerably lower than the District and Scott-Foresman programs for providing a full range of instruction, initial instruction, drill and practice, and reteaching. In general, McGraw-Hill received the lowest ratings of the three programs piloted at the junior high school. The small number of respondents for the survey (5 respondents) make it important to use caution in the interpretation of the results.

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E. The D. C. Heath Program

The D. C. Heath program had a preponderance of spontaneous comments that cited the excellent quality of the concept development, the sequencing, home communication, and enrichment materials. Teachers were especially appreciative of the parent information letters that produced positive comments from parents. As found with all programs, there were opposing views of whether the pacing was effective. Some complained the "pacing is too slow" while other said, "the program moves too fast for children to learn the concepts." The same thing was observed regarding the quantity of material, e.g., "there is just plenty of excellent material for all students" as contrasted with "I ran out of material during the 4th quarter."

The most common disadvantages cited revolved around the need to duplicate materials and the need for more practice and drill sheets. There was fairly strong agreement that the Heath program did not provide enough inservice assistance to teachers to enable them to provide more adequately for the range of learning speeds in the classroom.

All of the concerns and disadvantages are paralleled, however, with the previously reported survey report in which the highest percent of users, 79%, would recommend district adoption of the Heath program.

F. The Scott Foresman Program

Scott Foresman had a substantial number of teachers committed to the program and they tended to make high use of the skill-based record keeping forms and the supplementary materials. On the other hand, the survey in the elementary grades revealed the lowest ratings for Scott-Foresman of any of the programs for slow-learning students and the lowest over-all rating when compared with other programs these teachers had used. Some of the negative reactions to Scott Foresman appeared to be related to discrepancies in the teacher's edition and the student text as well as some errors found in the manuscript. When elementary teachers were asked by the survey whether they would recommend the program they were piloting for district adoption, 65% of the teachers piloting Scott Foresman said, "Yes." In the junior high schools, 75% said they would recommend the program for adoption.

G. In Conclusion

The findings presented in this summary indicate trends and themes of the most common practices and attitudes that were reflected in the implementation of the pilot. These common trends, practices, and attitudes are matched by somewhat less frequent but equally strong opposing beliefs and practices. Indeed, almost every aspect of a program that was cited as an advantage by some teachers was cited as a disadvantage by other teachers.

Elementary teachers in all grades K through Grade 6 in all schools gave the highest recommendations for adoption to the Addison-Wesley and D. C. Heath programs. Seventy-nine percent (79%) of the teachers piloting these programs recommended that the District adopt these programs. The Scott Foresman program received the lowest recommendation for adoption in the elementary schools piloting the program.

Junior high school teachers gave the highest recommendation for adoption to the District Program (90%) and also gave the District program the highest rating for providing the full range of instruction. Scott-Foresman and McGraw-Hill programs were less favorably rated for provisions to provide a full range of instruction.

It appears that no program materials are impervious to the influences of the teachers' organization and use of the materials in the classroom. The management and organization of the classroom may have profound influence upon the selection, pacing, and use of instructional materials. For example, when all students in the class are instructed as a total group it is likely to produce different effects and reactions from those produced when the class is divided into three groups based upon students' levels of achievement with different materials being selected to match the characteristic achievement of each group. Substantial differences in the sequence and pacing of materials (as well as the variety of supplementary materials) may be observed when one class is operated on the principle that mastery of each concept or math operation must be achieved before other concepts or contents are introduced while another class is operated on a schedule that predefines the days of introduction of concepts, initial instruction, practice, drill, assessment and then procedes to the next concept or content for instruction.

This evaluation of the implementation of the pilot provides assurance that a sincere and consistent effort to use each particular program as specified was demonstrated in the schools and classrooms participating. The variations in use of the materials observed may be largely the result of the central and significant influence of the teacher as the most important element in the instructional program.

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PART FIVE

PROGRAM RESULTS BY WEIGHTED ATTRIBUTES

PART FIVE
PROGRAM RESULTS BY WEIGHTED ATTRIBUTES

A. Method

Of the four components of the math pilot programs evaluation--student achievement, cost-effectiveness, and staff opinion--all enable the evaluators to prepare an objective ranking of the programs based on the outcomes of data collected for these components. The fourth component, observation of implementation, was conducted to see that the programs were actually used and does not yield a quantitative ranking as an outcome.

Nevertheless, programs vary in the outcomes and ranks on various measures. Some programs ranked high on certain measures and low on others. With such complexity, a way was sought to display the outcomes for the Superintendent and Board of Education and other readers of the report which takes into account the multiple factors and multiple outcomes. Since the Board of Education requested this evaluation, and they are the primary audience for the data, it was appropriate that they should indicate which of the factors measured were most and least important to them. In the fall of 1983, prior to any data availability, the members of the Board of Education ranked the attributes or factors in the math program evaluation on the basis of importance. The Board indicated that the factors were not of equal priority to them, and the results of their ranking are as follows, from most important (1) to least important (8):

1. Student achievement results in Concepts and Applications (problem solving).

2. Student achievement in Computation.

3. Achievement of students designated as middle-achieving (those in the middle two quarters by percentile scores).

4.5 (Tied rank for fourth and fifth.) Achievement of low-achieving and high-achieving students.

6. Cost per gain.

7. Staff opinion.

8. Program of least cost.

Three entries have been dropped as subanalyses because they were tied for last place (least importance), and one was dropped because it was the reciprocal of another factor and was also rated low in importance. The three dropped were achievement by male/female and scale score gain per $100 spent. Administrator opinion has been blended with teacher opinion to form No. 7, staff opinion. Since there are far more teachers responding than administrators, the results presented reflect more weight given to teacher opinion than administrator.

A method of analysis called multiattribute evaluation gives numerical weights to the rank-order factors of importance. Compiled with the results from the data, one is able to display outcomes for programs overall and show comparative results. As a guide, several references were used, with the most important being MULTIATTRIBUTE EVALUATION by Ward Edwards and J. Robert Newman (Sage Publications, 1982).

In addition to following the Board's direction of ranking, tables of equal weighting to each of the factors were calculated. The results were basically the same. At grade 3, the top program and fourth program were the same, but two and three switched places. At grade 6, the top two programs ranked the same, but three and four switched places. At grade 8, results were exactly the same. These tables are included in Appendix I.

Table 1 shows the rank sum weights of each factor, the total of which adds to 1.0. Following are three tables giving the weights and results of weighting with totals at the bottom for the grade level. Ranks were derived as follows.

For the student achievement factors (the first five attributes), adjusted posttest scores after analysis of covariance were used to rank the programs where significance was found. Where there was no significance, programs were assigned tied ranks. For example in grades 3 through 6 when there is a tied rank among the four programs, each program receives a rank of 2.5. The program rank points for the four programs are inverse to the rank. That is, the first or highest ranking program receives 4 points; the second, 3; the third, 2; and the lowest, 1.

For the staff opinion section, a median score was derived from each program, giving a weight of 1 to each of the items in Part Four, Tables 3, 4 and 6, and a weight of 2 to each of the three items dealing with reaction to the overall text/program, Tables 5 and 7. A median reflects the midpoint or 50th percentile of response.

For the per student cost gain, Table 7 from the cost analysis section (Part Three) is referenced. The per student cost is divided by the adjusted gain scores, and least cost is also derived from Table 5, page

B. Results

For grade 3, the programs in order of most points to least are:

Heath
District
Scott Foresman
Addison-Wesley

For grade 6, the programs in order of weighted rank are:

District
Scott Foresman
Addison-Wesley
Heath

For a combined K-6, the results are:

District
Scott Foresman
Heath
Addison-Wesley

For grade 8, the programs rank as follows:

District
McGraw-Hill
Scott Foresman

Table 1

Derivation of Rank Sum Weights

Rank		Program Rank Points (Inverse Rank)	Rank Sum Weight
1	Student Achievement Concepts/Applications	8	.222
2	Student Achievement Computation	7	.194
3	Student Achievement Middle Achieving Students	6	.167
4.5	Student Achievement Low Achieving Students	4.5	.125
4.5	Student Achievement High Achieving Students	4.5	.125
6	Cost per Gain	3	.083
7	Staff Opinion	2	.056
8	Least Cost for Materials	1	.028
		36	1.000

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Table 2

Program Results
Based on Weighted Attributes
Grade 3

Factor	Rank Sum Weight	Program Rank Points for Factor				Program Weighted Score			
		AW	D	H	SF	AW	D	H	SF
Student Achievement - Concepts/Applications	.222	1	3	4	2	.222	.666	.888	.444
Student Achievement - Computation	.194	2	1	4	3	.388	.194	.776	.582
Student Achievement - Middle Group	.167*	2.5	2.5	2.5	2.5	.418	.418	.418	.418
Student Achievement - Low Group	.125*	2.5	2.5	2.5	2.5	.313	.313	.313	.313
Student Achievement - High Group	.125	1	2	4	3	.125	.250	.500	.375
Cost Per Gain	.083	1	4	3	2	.083	.332	.249	.166
Staff Opinion	.056	4	3	1.5	1.5	.224	.168	.084	.084
Least Cost	.028	2	4	3	1	.056	.112	.084	.028
				WEIGHTED SCORE TOTALS:		1.829	2.453	3.312	2.410

*No statistically significant difference between programs. All programs given equal rank.

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Table 3

Program Results
Based on Weighted Attributes
Grade 6

Factor	Rank Sum Weight	Program Rank Points for Factor				Program Weighted Score			
		AW	D	H	SF	AW	D	H	SF
Student Achievement - Concepts/Applications	.222	2	4	1	3	.444	.888	.222	.666
Student Achievement - Computation	.194	2	4	1	3	.388	.776	.194	.582
Student Achievement - Middle Group	.167	2	4	1	3	.334	.668	.167	.501
Student Achievement - Low Group	.125*	2.5	2.5	2.5	3	.313	.313	.313	.313
Student Achievement - High Group	.125	2	4	1	2.5	.250	.500	.125	.375
Cost Per Gain	.083	1	4	2.5	2.5	.083	.332	.208	.208
Staff Opinion	.056	1	4	2.5	2.5	.056	.224	.140	.140
Least Cost	.028	1	4	3	2	.028	.112	.084	.056
				WEIGHTED SCORE TOTALS:		1.896	3.813	1.453	2.841

*No statistically significant difference between programs. All programs given equal rank.

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Table 4

Program Results
Based on Weighted Attributes
Grade 6

Factor	Rank Sum Weight	Program Rank Points for Factor			Program Weighted Score		
		D	McG-H	SF	D	McG-H	SF
Student Achievement - Concepts/Applications	.222	3	2	1	.666	.444	.222
Student Achievement - Computation	.194*	2	2	2	.388	.388	.388
Student Achievement - Middle Group	.167*	2	2	2	.334	.334	.334
Student Achievement - Low Group	.125*	2	2	2	.250	.250	.250
Student Achievement - High Group	.125*	2	2	2	.250	.250	.250
Cost Per Gain	.083	3	2	1	.249	.116	.083
Staff Opinion	.056	2.5	1	2.5	.140	.056	.140
Least Cost	.028	3	2	1	.084	.056	.028
				WEIGHTED SCORE TOTALS:	2.36	1.89	1.70

*No statistically significant difference between programs. All programs given equal rank.

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PART SIX

RECOMMENDATIONS

PART SIX
RECOMMENDATION

It is recommended that the Board of Education use results of the second year report rather than take action on the basis of this report and allow staff to use these data as a basis for refining the second year study now in progress. The Board has determined to defer adoption of new program(s) until 1986 for 1987-88 implementation to synchronize with state adoption. Results of this report may be used for decisions regarding replacement of worn-out old matrix materials until that time.

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San Diego City Schools

EVALUATION DEPARTMENT REPORT

FIRST YEAR EVALUATION OF THE MATHEMATICS PILOT PROGRAMS GRADES K-8 APPENDICES

No. 381

October 23, 1984

PLANNING, RESEARCH AND EVALUATION DIVISION

FIRST YEAR EVALUATION
OF THE
MATHEMATICS PILOT PROGRAM
GRADES K-8

Prepared by

Dr. Elizabeth A. Tomblin
Dr. Stephen W. Isaac
Dr. J. Richard Harsh
Janet E. Hintzman

October 23, 1984

Integration and District Programs Unit
Elizabeth A. Tomblin, Ph.D.
Associate Director
Evaluation Department
Stephen Isaac, Ph.D.
Director
Planning, Research, and Evaluation Division
Dean H. Nafziger, Ph.D.
Assistant to the Superintendent

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APPENDIX A

COMPOSITION OF STUDENT SAMPLE

TABLE A

STUDENT COMPOSITION
GRADE 3

	TOTAL # OF STUDENTS	# LOW	% LOW	# MID	% MID	# HIGH	% HIGH
DISTRICT	357	47	13	135	38	175	49
SCOTT FORESMAN	201	34	17	85	42	82	41
HEATH	272	25	9	103	38	144	53
ADDISON-WESLEY	304	35	12	118	39	151	50
PILOT TOTALS	1134	141	12	441	39	552	49

TABLE B

STUDENT COMPOSITION
GRADE 6

	TOTAL # OF STUDENTS	# LOW	% LOW	# MID	% MID	# HIGH	% HIGH
DISTRICT	353	49	14	185	52	119	34
SCOTT FORESMAN	258	41	16	128	50	89	34
HEATH	322	36	11	159	49	127	39
ADDISON-WESLEY	410	36	9	210	51	164	40
PILOT TOTALS	1343	162	12	682	51	499	37

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TABLE C

STUDENT COMPOSITION
GRADE 8

	TOTAL # OF STUDENTS	# LOW	% LOW	# MID	% MID	# HIGH	% High
DISTRICT	204	43	21	138	68	23	11
SCOTT FORESMAN	130	21	16	103	79	6	5
MCGRAW-HILL	136	27	20	95	70	14	10
PILOT TOTALS	470	91	19	336	71	43	9

TABLE D

STUDENT COMPOSITION
TOTAL PILOT

	TOTAL # OF STUDENTS	# LOW	% LOW	# MID	% MID	# HIGH	% HIGH
	2947	394	13	1459	50	1094	37

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TABLE E

Math Pilot Program
Total Ns* at Grades 3, 6, and 8

	Grade 3	Grade 6	Grade 8
ADDISON-WESLEY	456	501	-
DISTRICT	584	613	414
HEATH	351	408	-
SCOTT FORESMAN	325	333	224
McGRAW-HILL	-	-	271
TOTALS	1716	1855	909

TOTAL ELEMENTARY: 3571

GRAND TOTAL: 4480
(Elementary & Grade 8)

*Ns = Sums of average of November 1983 and January 1984 enrollments at each site (taken from district census report).

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APPENDIX B

STUDENT ACHIEVEMENT LEVEL PERFORMANCE ON TOTAL MATH BY PUBLISHERS

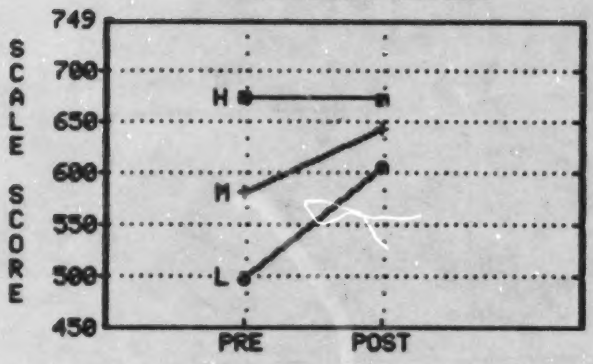
TABLE A

TOTAL MATH*

GRADE 3

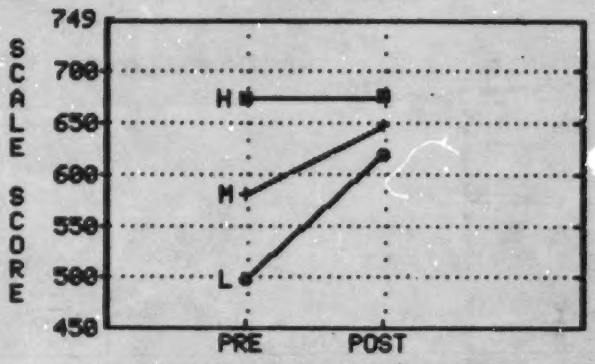
BY STUDENT ACHIEVEMENT LEVELS

ADDISON WESLEY



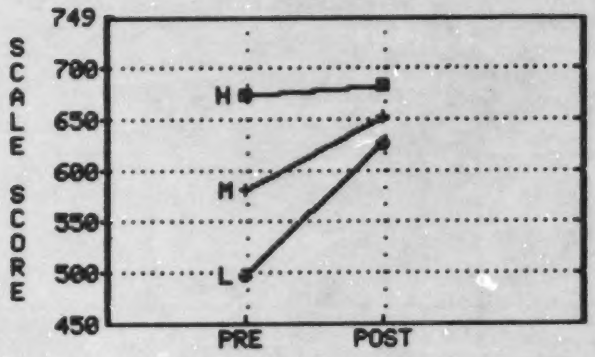
	H N=131	M N=118	L N= 35
PRE	674.34	581.60	496.21
POST	671.65	643.10	605.92
GAIN	-2.69	61.50	109.71

DISTRICT



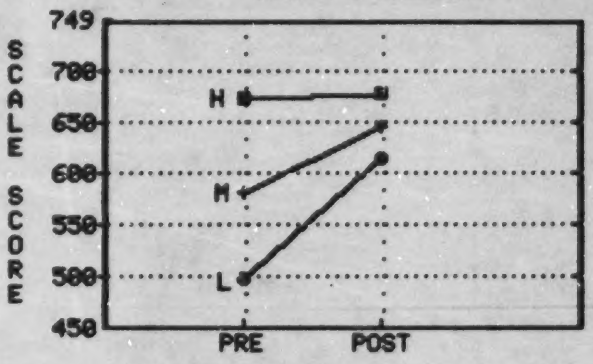
	H N= 175	M N= 135	L N=47
PRE	674.34	581.60	496.21
POST	676.36	647.01	618.63
GAIN	2.02	65.41	122.42

HEATH



	H N= 144	M N= 103	L N= 25
PRE	674.34	581.60	496.21
POST	683.15	652.58	627.28
GAIN	8.81	70.98	131.07

SCOTT FORESMAN



	H N= 82	M N= 85	L N= 34
PRE	674.34	581.60	496.21
POST	678.93	646.60	614.18
GAIN	4.59	65.00	117.97

H = HIGH ACHIEVING STUDENTS
M = MIDDLE ACHIEVING STUDENTS
L = LOW ACHIEVING STUDENTS

*All scores are means adjusted by using analysis of covariance

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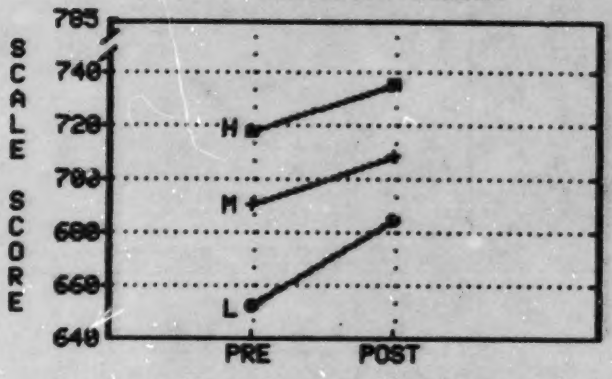
TABLE B

TOTAL MATH*

GRADE 6

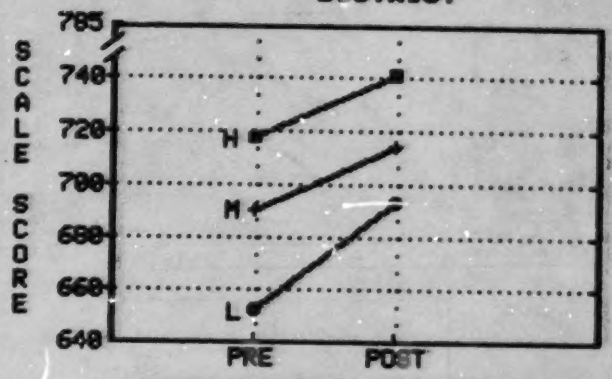
BY STUDENT ACHIEVEMENT LEVELS

ADDISON MESLEY



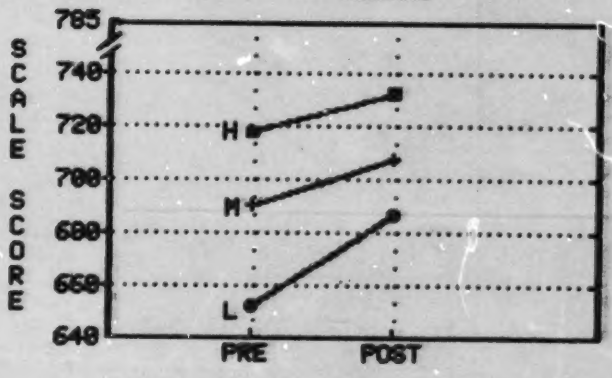
	H N= 164	M N= 210	L N= 36
PRE	718.60	690.88	651.58
POST	735.22	708.78	684.59
GAIN	16.62	17.90	33.01

DISTRICT



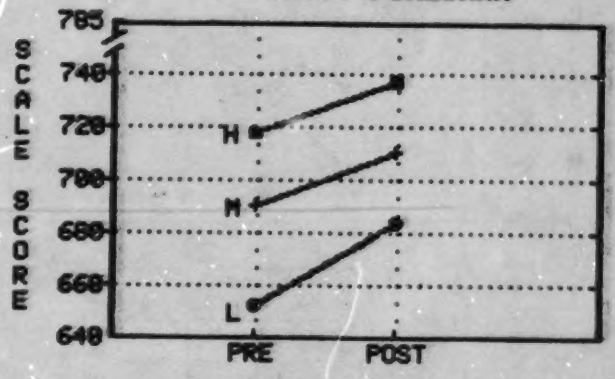
	H N= 119	M N= 185	L N=49
PRE	718.60	690.88	651.58
POST	741.26	714.40	692.83
GAIN	22.66	23.52	41.25

HEATH



	H N= 129	M N=159	L N= 36
PRE	718.60	690.88	651.58
POST	732.66	707.40	686.52
GAIN	14.06	16.52	34.92

SCOTT FORESMAN



	H N= 89	M N= 128	L N= 41
PRE	718.60	690.88	651.58
POST	736.98	710.28	683.96
GAIN	18.38	19.40	32.38

H = HIGH ACHIEVING STUDENTS
M = MIDDLE ACHIEVING STUDENTS
L = LOW ACHIEVING STUDENTS

*All scores are means adjusted by using analysis of covariance

TABLE C

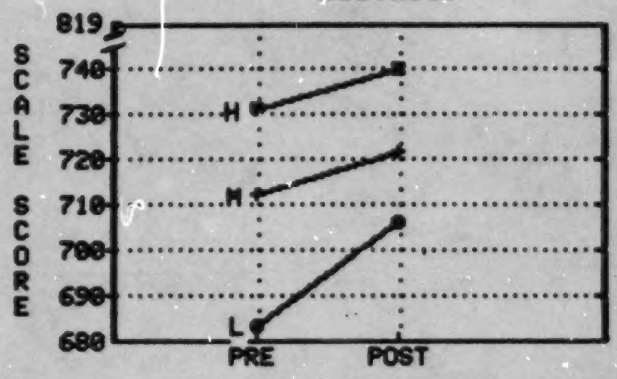
TOTAL MATH*

GRADE [illegible]

BY STUDENT ACHIEVEMENT LEVELS

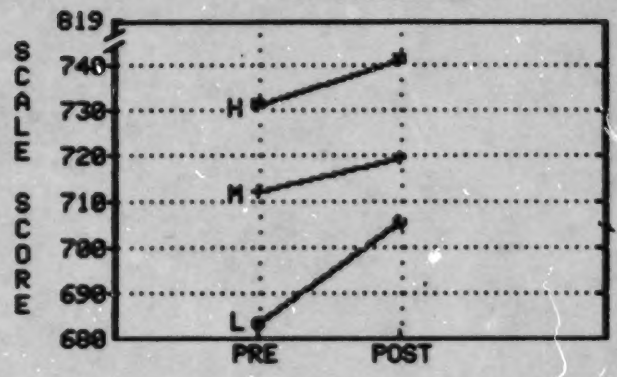
DISTRICT

	H N= 23	M N= 138	L N= 43
PRE	731.05	712.43	682.91
POST	740.15	721.60	705.21
GAIN	9.10	9.17	22.30



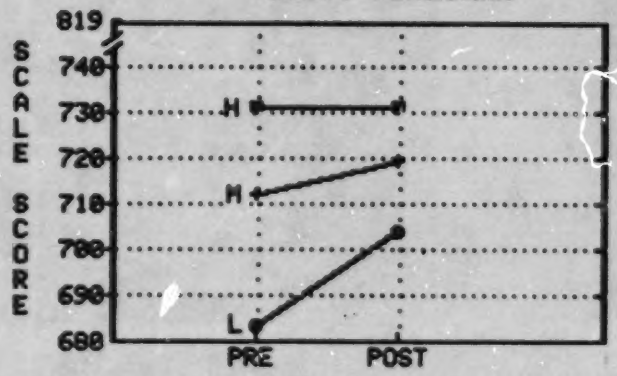
MC GRAW HILL

	H N= 6	M N= 95	L N= 27
PRE	731.05	712.43	682.91
POST	731.38	719.50	705.41
GAIN	0.33	7.07	22.50



SCOTT FORESMAN

	H N= 6	M N= 103	L N= 21
PRE	731.05	712.43	682.91
POST	731.38	719.71	703.67
GAIN	0.33	7.28	20.76



H = HIGH ACHIEVING STUDENTS
M = MIDDLE ACHIEVING STUDENTS
L = LOW ACHIEVING STUDENTS

*All scores are means adjusted by using analysis of covariance

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APPENDIX C

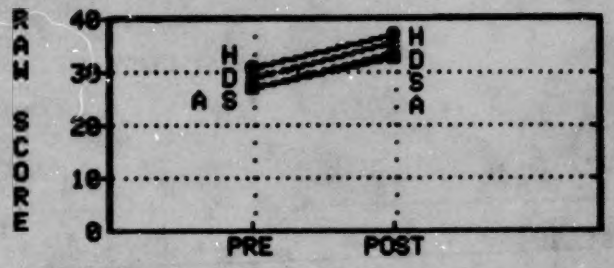
STUDENT ACHIEVEMENT SCORE CONVERSIONS

TABLE A

SCORE COMPARISONS
GRADE 3
CONCEPTS & APPLICATIONS

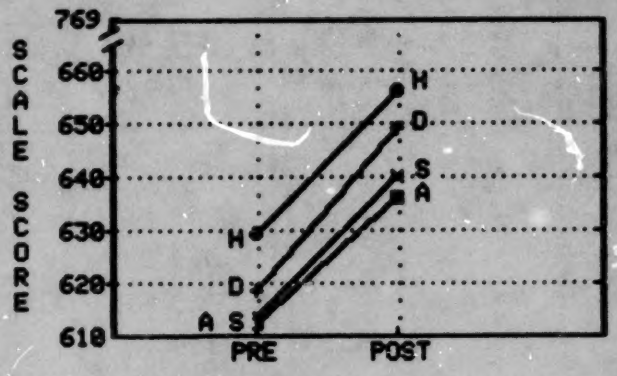
RAW SCORE

	A-W N= 305	D N= 358	H N= 272	S-F N= 201
PRE	27	29	31	27
POST	33	36	37	34
GAIN	6	7	6	7



SCALE SCORE

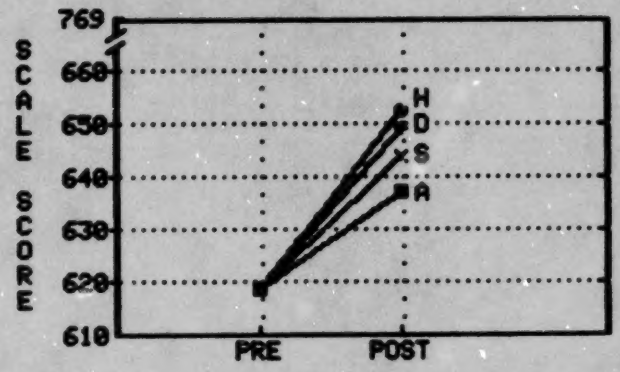
	A-W N= 305	D N= 358	H N= 272	S-F N= 201
PRE	612.05	618.53	629.29	613.61
POST	636.31	649.06	656.44	640.05
GAIN	24.26	30.53	27.15	26.44



COVARIANCE ADJUSTED*

	A-W N= 305	D N= 358	H N=272	S-F N=201
PRE	618.50	618.50	618.50	618.50
POST	637.25	649.11	652.40	644.02
GAIN	18.75	30.61	33.90	25.52

Differences significant (p=.000)



*All scores are means adjusted by using analysis of covariance

A = ADDISON WESLEY
D = DISTRICT PROGRAM
H = D. C. HEATH
S = SCOTT FORESMAN

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TABLE B

ADJUSTED POSTTEST MEANS* AND "p-VALUES$^{\Theta}$" FOR ALL COVARIANCE TESTS PERFORMED BY SUBTEST, PROGRAM, AND GRADE LEVEL

ALL STUDENTS BY PROGRAM AND SUBTEST PROGRAMS				
Grade	Program	Computation	Concepts and Applications	Total Math
3		p = .027	p = .000	p = .000
	Addison-Wesley	667.37	637.25	652.46
	District	665.95	649.11	657.91
	Heath	673.44	652.40	663.52
	Scott, Foresman	670.57	644.02	657.90
6		p = .000	p = .000	p = .000
	Addison-Wesley	726.40	705.12	715.60
	District	729.91	713.13	721.90
	Heath	723.38	704.53	714.31
	Scott, Foresman	725.94	706.93	716.99
8		p = .251	p = .002	p = .057
	District	792.68	707.80	720.40
	McGraw-Hill	734.16	703.33	718.86
	Scott, Foresman	731.91	701.94	717.50

Θ - Significance Level of Covariance Test (<.05 is significant)

* - Rounded to hundredths

TABLE C

ADJUSTED POSTTEST MEANS* AND "p-VALUES$^{\Theta}$" FOR ALL COVARIANCE TESTS PERFORMED BY SUBTEST, PROGRAM, AND GRADE LEVEL

ADJUSTED POST MEANS - LOW ACHIEVERS PROGRAMS				
Grade	Program	Computation	Concepts and Applications	Total Math
3		p = .712	p = .105	p = .29
	Addison-Wesley	625.81	585.75	605.92
	District	635.75	601.26	618.63
	Heath	634.16	607.48	621.28
	Scott, Foresman	628.17	599.63	614.18
6		p = .002	p = .624	p = .101
	Addison-Wesley	703.88	665.81	684.60
	District	712.10	672.32	692.83
	Heath	700.99	671.88	686.52
	Scott, Foresman	699.92	667.14	683.96
8		p = .358	p = .339	p = .906
	District	718.13	692.31	705.21
	McGraw-Hill	723.23	687.81	705.41
	Scott, Foresman	721.95	684.26	703.67

Θ - Significance Level of Covariance Test (<.05 is significant)

* - Rounded to hundredths

TABLE D

ADJUSTED POSTTEST MEANS* AND "p-VALUES⊖" FOR ALL COVARIANCE TESTS PERFORMED BY SUBTEST, PROGRAM, AND GRADE LEVEL

ADJUSTED POST MEANS - MID ACHIEVERS PROGRAMS				
Grade	Program	Computation	Concepts and Applications	Total Math
3		p = .56	p = .002	p = .064
	Addison-Wesley	660.08	625.05	643.10
	District	657.96	634.65	647.01
	Heath	663.34	640.33	652.58
	Scott, Foresman	662.56	629.41	646.60
6		p = .000	p = .000	p = .000
	Addison-Wesley	721.85	695.57	708.78
	District	726.34	702.47	714.69
	Heath	719.72	694.48	707.40
	Scott, Foresman	722.26	697.45	710.28
8		p = .523	p = .025	p = .089
	District	735.02	707.71	721.60
	McGraw-Hill	734.68	703.80	719.48
	Scott, Foresman	733.73	704.92	719.71

⊖ - Significance Level of Covariance Test (<.05 is significant)

* - Rounded to hundredths

TABLE E

ADJUSTED POSTTEST MEANS* AND "p-VALUES$^{\Theta}$" FOR ALL COVARIANCE TESTS PERFORMED BY SUBTEST, PROGRAM, AND GRADE LEVEL

ADJUSTED POST MEANS - HIGH ACHIEVERS PROGRAMS				
Grade	Program	Computation	Concept and Applications	Total Math
3		p = .008	p = .033	p = .015
	Addison-Wesley	684.05	660.12	671.65
	District	679.77	672.36	676.36
	Heath	690.99	674.14	683.15
	Scott, Foresman	688.87	667.62	678.93
6		p = .029	p = .001	p = .001
	Addison-Wesley	739.66	731.06	735.22
	District	740.10	742.07	741.26
	Heath	735.71	728.36	732.56
	Scott, Foresman	740.22	732.58	736.28
8		p = .186	p = .288	p = .335
	District	744.92	735.85	740.15
	McGraw-Hill	751.45	730.25	741.59
	Scott, Foresman	739.41	720.31	731.38

Θ - Significance Level of Covariance Test (< .05 is significant)

* - Rounded to hundredths

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TABLE F

CONVERSION OF ADJUSTED POST MEAN SCORES* FOR TOTAL MATH, TO PERCENTILE RANK

ALL STUDENTS BY PROGRAM AND GRADE

GRADE	PROGRAM	ADJ. MEAN	PERCENTILE
3	Addison Wesley	652.46	70
	District	657.91	77
	Heath	663.52	81
	Scott Foresman	657.90	77
6	Addison Wesley	715.60	79
	District	721.90	88
	Heath	714.30	77
	Scott Foresman	716.99	81
8	District	720.40	52
	Mc Graw Hill	718.86	51
	Scott Foresman	717.50	46

LOW ACHIEVING STUDENTS

3	Addison Wesley	605.92	22
	District	618.63	33
	Heath	621.27	34
	Scott Foresman	614.18	29
6	Addison Wesley	684.59	27
	District	692.83	38
	Heath	686.52	29
	Scott Foresman	683.95	26
8	District	705.21	24
	Mc Graw Hill	705.41	25
	Scott Foresman	703.67	23

MIDDLE ACHIEVING STUDENTS

3	Addison Wesley	643.10	60
	District	647.01	65
	Heath	652.58	71
	Scott Foresman	646.60	64
6	Addison Wesley	708.78	69
	District	714.69	78
	Heath	707.40	66
	Scott Foresman	710.28	71
8	District	721.60	54
	Mc Graw Hill	719.43	51
	Scott Foresman	719.71	51

HIGH ACHIEVING STUDENTS

3	Addison Wesley	671.65	86
	District	676.36	89
	Heath	683.15	91
	Scott Foresman	678.93	90
6	Addison Wesley	735.22	95
	District	741.26	97
	Heath	732.56	94
	Scott Foresman	736.98	96
8	District	740.15	86
	Mc Graw Hill	741.59	88
	Scott Foresman	731.37	68

*NOTE - "Adjusted Means", under covariance, are converted to "Normalized Means", then to "Percentile Ranks", in accord with publishers procedures.

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APPENDIX D

COMPUTATION OF DUPLICATING COSTS

SAN DIEGO CITY SCHOOLS

EDUCATION CENTER | 4100 Normal Street

DATE: October 7, 1983

MEMO TO: Wingard

FROM: Bethel MB

SUBJECT: DISTRICT MATHEMATICS PILOTS, 1983-84
FUNDS REQUIRED TO PROVIDE PAPER/
THERMOFAX MASTERS

1. A summary of the estimated cost of paper/thermofax masters needed to duplicate the commercial textbook support packages at the pilot schools is listed below:

Addison Wesley Pilot	$5,536.77
Heath Pilot	3,196.69
Scott, Foresman Pilot	3,987.96
McGraw-Hill	88.70
Total	$12,810.12

It should be noted that this summary does not include the following very real costs:

- teacher time to duplicate materials
- duplicating fluid
- additional wear and servicing of copy machines

2. Each textbook company produces some program components on a per student basis. An additional option is to purchase available components on a per student basis and the paper/thermofax masters when components are unavailable. This option saves teacher time and provides for an even quality of student materials.

1. Addision Wesley Mathematics Pilot

a. Pilot participants:

3458 students

197 teachers

b. Analysis of support package :

Program Component	Format of Component	Number of Pages	Estimated Cost of paper	Estimated cost of Thermofax Masters
Tests	Duplicating Masters	45	.1647 per student (45 x .00366)	——
Resource Book, Workbook, Extending the Ideas	Blackline Masters	392 Total 196 est. per student	.71736 per student (196 x .00366)	$12.6224 per teacher (392 x .0322)
		TOTAL	.88206 per student	$12.6224 per teacher

c. Estimated cost of paper/thermofax masters needed to duplicate support package:

3050.16 + 2486.61

(3458 x .88206) + (197 x 12.6224) $ 5,536.77

d. Estimated cost of purchasing available components on a per student basis and duplicating material if components are unavailable.

The Workbook (2.98) and Extending the Ideas (3.12) may be purchased from Addison Wesley on a per student basis. The Tests and Resource Book are available only in master format. The estimated cost of purchasing the two booklets and the paper and thermofax masters for duplicating the Tests and Resource Books is as follows: --

Workbook
3458 students x 2.76 (average cost of workbook, 1-6) 9,544.08

Extending the Ideas
1383 students (40% of pilot population) x 2.87 (avg. cost per booklet) 3,969.21

Tests
3458 students x .1647 (cost of paper) 569.53

Resource Book
3458 students x .366 (cost of paper) +
197 teachers x 6.44 (cost of thermofax masters) 2,534.31

TOTAL $16,617.13

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3. Scott, Foresman Mathematics Pilot

a. Pilot participants:

3521 students

217 teachers

b. Analysis of support package

Scott Foresman	Format of Component	Number of Pages	Estimated Cost of paper	Estimated cost of Thermofax Masters
Tests	Duplicating Masters	57	.2086 per student (57 x .00366)	——
Problem Solving, Enrichment, Reteaching	Duplicating Masters	160 Total 80 est. per student	.2928 per student (80 x .00366)	
Resource Masters	Blackline Masters	165 Total 83 est. per student	.30378 per student (83 x .00366)	5.313 per teacher (165 x .0322)
		TOTAL	.80518 per student	5.313 per teacher

c. Estimated cost of paper/thermofax masters needed to duplicate support package:

$2,835.04 + $1,152.92

(3521 x .80518) + (217 x 5.313) $3,987.96

d. Estimated cost of purchasing available components on a per student basis and duplicating material if components are unavailable.

The Test Booklet (1.14) may be purchased from Scott, Foresman on a per student basis. The remainder of the program components are available only in master format. The estimated cost of purchasing the booklet and the paper and thermofax masters for duplicating the remaining components is as follows:

Test Booklet
3521 students x 1.14 (cost of booklet) 4,013.94

Problem Solving, Enrichment, Reteaching, Resource Masters
3521 students x .59658 (cost of paper) +
217 teachers x 5.313 (cost of thermofax masters) 3,253.48

TOTAL $7,267.42

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5. Cost of providing materials on a district wide basis:

a. Student and Teacher Population

K-6: 59,403 students (September 23, 1983 enrollment)

7-8: 18,226 students (September 23, 1983 enrollment)

K-6: 1980 teachers (estimate, 59,403 ÷ 30)

7-8: 200 teachers (estimate)

b. Analysis of the cost of providing suppport materials on a district wide basis:

Program	Option 1: Cost of providing paper/thermofax masters	Option 2: Cost of providing components on per student basis
Addison Wesley, K-6	$77,3[illegible].36 (59,403 x .88206) + (1980 x 12.6224)	$276, 422.72 (59,403 x 2.76) + (23,761 x 2.87) + (59,403 x .1647) + (59,403 x .366) + (1980 x 6.44)
Heath, K-6	$58,267.21 (59,403 x .98088)	$216,725.46 (59,403 x 2.24) + (23,761 x 2.24) + (59,403 x .5124)
Scott, Foresman, K-8	$74,087.66 (77,629 x .80518) + (2180 x 5.313)	$146,391.31 (77,629 x 1.14) + (77,629 x .59658) + (2180 x 5.313)
McGraw-Hill, 7-8	$1,684.38 (18,226 x .08418) + (200 x .7406)	$1,684.38 (18,226 x .08418) + (200 x .7406)

Note: Even with Option 2, teachers will need to spend considerable time duplicating materials.

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Obtained from Zyndell Wasser
10/5/83

Zyndell stated that additional books have been ordered. Suggested adding 50 student books and 35 teachers editions to each Pilot order to cover. (45 to Scott)

DMP

INITIAL BOOK ORDERS

Addison Wesley

	SB	TE
K	569	20
1	592	27
2	520	24
3	547	25
4	554	24
5	531	23
6	559	19
	3,378	162
	+ 80	+35
Total:	3,458	197

Scott

	SB	TE
K	319	15
1	336	19
2	355	23
3	375	21
4	441	25
5	417	24
6	398	22
7	440	15
8	360	8
	3,441	172
	+80	+45
Total:	3,521	217

Heath

	SB	TE
K	409	17
1	419	20
2	434	22
3	474	25
4	490	21
5	491	23
6	462	19
	3,179	147
	+80	+35
Total:	3,259	192

McGraw-Hill

	SB	TE
7	381	12
8	336	11
	717	26
	+20	+10
Total:	737	36

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4. McGraw Hill

a. Pilot Participants:

737 students

36 teachers

b. Analysis of support package:

Program Component	Format of Component	Number of Pages	Estimated Cost of paper	Estimated cost of Thermofax Masters
Tests	Blackline Masters	23	.08418 per student (23 x .00366)	.7406 per teacher (23 x .0322)
Other	—	—	—	—
			.08418 per student	.7406 per teacher

c. Estimated cost of paper/thermofax masters needed to duplicate support package:

62.04 + 26.66

(737 x .08418) + (36 x .7406) $88.70

d. Estimated cost of purchasing available components on a per student basis and duplicating material if components are unavailable.

The tests are not available on a per student basis so must be duplicated The cost is the same as shown in C.

TOTAL $88.70

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2. Heath Mathematics Pilot

a. Pilot participants:

3259 students

182 teachers

b. Analysis of support package:

Heath	Format	Number of Pages	Estimated Cost of paper	Estimated cost of Thermofax Masters
Tests	Duplicating Masters	50 (est.)	.183 (50 x .00366)	——
Basic Worksheets, Enrichment, Copy Masters	Duplicating Masters	436 Total 218 est. per student	.79788 (218 x .00366)	——
		TOTAL	.98088 per student	——

c. Estimated cost of paper/thermofax masters needed to duplicate support package:

(3259 x .98088) $ 3,196.69

d. Estimated cost of purchasing available components on a per student basis and duplicating material if components are unavailable.

The Basic Worksheets (2.24 and Enrichment Worksheets (2.24) may be purchased from Heath on a per student basis. The Tests and Copy Masters are available only in master format. The estimated cost of purchasing the booklets and the paper for duplicating the Tests and Copy Masters is as follows:

Basic Worksheets 3259 students x 2.24 (cost of booklet)	7,300.16
Enrichment Worksheet 1304 (40% of pilot population) x 2.24 (avg. cost per booklet)	2,920.96
Tests and Copy Masters 3259 students x .5124 (cost of paper) (140 pages x .00366)	1,669.91
TOTAL	$11,891.03

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A summary of the estimated cost of this option for the pilot schools is listed below:

Addison Wesley Pilot	$16,617.13
Heath Pilot	11,891.03
Scott, Foresman Pilot	7,267.42
McGraw-Hill Pilot	88.70
Total	$35,864.28

3. A summary of the cost of providing the support package for <u>each</u> text on a district wide basis is listed below:

	<u>Option 1</u>: Cost of paper/ thermofax masters	<u>Option 2</u>: Cost of components (per student basis)
Addison Wesley, K-6	$77,389.36	$276,422.72
Heath, K-6	$58,267.21	$216,725.46
Scott, Foresman, K-8	$74.087.66	$146,391.31
McGraw-Hill, 7-8	$1,684.38	$1,684.38

The following assumptions were used in the calculation of the cost figures:

1. The test package will be used by each student.
2. Fifty percent of the remaining material will be used by each individual student. However, the teacher will need to duplicate a complete set of the material because some students will use reteaching, some enrichment, etc.
3. Enrichment materials, purchased on a per student basis, will be used by forty percent of the student population.
4. Duplicating masters and paper may be purchased for the following:

Thermofax masters	Stock # 17-M-1390	$3.22 per package of 100 (.0322 per master)
Paper	Stock # 17-P-2048	$1.83 per package of 500 (.00366 per sheet)

Back-up information for each calculation summarized in this memo is attached for your review.

BB:jr

APPENDIX E

APPROVED LIST OF PILOT PROGRAM MATERIALS

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Addison Wesley: Mathematics In Our World

Grade K

Student Edition (Consumable)	per student
Big Book	per teacher
Teacher Edition with resource book	per teacher
Module Tests	per teacher

Grade 1

Student Edition (Consumable)	per student
Student Edition - Spanish	per student (if needed)
Teacher Edition with resource book	per teacher
Workbook (blackline masters)	per teacher
Workbook - Spanish	per teacher (if needed)
Workbook - Teacher Edition	per teacher
Extending the Ideas (blackline masters)	per teacher
Teacher Edition - Extending the Ideas	per teacher
Module Tests	per teacher

Grade 2

Student Edition (Consumable)	per student
Student Edition - Spanish	per student (if needed)
Teacher Edition with resource book	per teacher
Workbook (blackline masters)	per teacher
Workbook - Spanish (blackline masters)	per teacher (if needed)
Workbook - Teacher Edition	per teacher
Extending the Ideas (blackline masters)	per teacher
Teacher Edition - Extending the Ideas	per teacher
Module Tests	per teacher

Grade 3

Student Edition - Write-in Text	per student
Student Edition - Write-in Text - Spanish	per student (if needed)
Teacher Edition with resource book	per teacher
Workbook (blackline masters)	per teacher
Workbook - Spanish	per teacher (if needed)
Workbook - Teacher Edition	per teacher
Extending the Ideas (blackline masters)	per teacher
Teacher Edition - Extending the Ideas	per teacher
Module Tests	per teacher

Grade 4

Student Edition	per student
Teacher Edition with resource book	per teacher
Workbook (blackline masters)	per teacher
Workbook - Spanish	per teacher (if needed)
Workbook - Teacher Edition	per teacher
Extending the Ideas (blackline masters)	per teacher
Teacher Edition - Extending the Ideas	per teacher
Module Tests	per teacher

Addison Wesley: Mathematics In Our World

Grade 5

Student Edition	per student
Teacher Edition with resource book	per teacher
Workbook (blackline masters)	per teacher
Workbook - Spanish	per teacher (if needed)
Workbook - Teacher Edition	per teacher
Extending the Ideas (blackline masters)	per teacher
Teacher Edition - Extending the Ideas	per teacher
Module Tests	per teacher

Grade 6

Student Edition	per student
Teacher Edition with resource book	per teacher
Workbook (blackline masters)	per teacher
Workbook - Spanish	per teacher (if needed)
Workbook - Teacher Edition	per teacher
Extending the Ideas (blackline masters)	per teacher
Teacher Edition - Extending the Ideas	per teacher
Module Tests	per teacher

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D. C. Heath & Co., Heath Mathematics

Grade K

Student Edition (Consumable)	per student	
Big Book	per teacher	
Teacher Edition - Big Book	per teacher	(if needed)
Basic Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Basic Work Sheets	per teacher	
Enrichment Work Sheets (duplicating masters)	per 2 teachers	(if needed)
Teacher Edition - Enrichment Work Sheets	per teacher	
Copy Masters	per teacher	
Spanish: Parent Involvement (duplicating masters)	per teacher	(if needed)

Grade 1

Student Edition (Consumable)	per student	
Teacher Edition	per teacher	
Personalized Learning Packet (duplicating masters)	per teacher	
Copy Masters	per teacher	
Teacher Edition: Workbook - Problem Solving	per teacher	
Spanish: Parent Involvement (duplicating masters)	per teacher	(if needed)
Spanish: Basic Work Sheets (duplicating masters)	per teacher	(if needed)
Spanish: Tests (duplicating masters)	per teacher	(if needed)
Basic Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Basic Work Sheets	per 2 teachers	
Enrichment Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Enrichment Work Sheets	per 2 teachers	

Grade 2

Student Edition (Consumable)	per student	
Teacher Edition	per teacher	
Personalized Learning Packet (duplicating masters)	per teacher	
Copy Masters	per teacher	
Teacher Edition: Workbook - Problem Solving	per teacher	
Spanish: Parent Involvement (duplicating masters)	per teacher	(if needed)
Spanish: Basic Work Sheets (duplicating masters)	per teacher	(if needed)
Spanish: Tests (duplicating masters)	per teacher	(if needed)
Basic Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Basic Work Sheets	per 2 teachers	
Enrichment Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Enrichment Work Sheets	per 2 teachers	

D. C. Heath & Co., Heath Mathematics

Grade 3

Student Edition (Consumable)	per student	
Teacher Edition	per teacher	
Personalized Learning Packet (duplicating masters)	per teacher	
Copy Masters	per teacher	
Teacher Edition: Workbook - Problem Solving	per teacher	
Spanish: Parent Involvement (duplicating masters)	per teacher	(if needed)
Spanish: Basic Work Sheets (duplicating masters)	per teacher	(if needed)
Spanish: Tests (duplicating masters)	per teacher	(if needed)
Spanish: Problem Solving (duplicating masters)	per teacher	(if needed)
Basic Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Basic Work Sheets	per 2 teachers	
Enrichment Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Enrichment Work Sheets	per 2 teachers	

Grade 4

Student Edition	per teacher	
Teacher Edition	per teacher	
Personalized Learning Packet (duplicating masters)	2 per teacher	
Copy Masters	per teacher	
Teacher Edition: Workbook - Problem Solving	per teacher	
Spanish: Parent Involvement (duplicating masters)	per teacher	(if needed)
Spanish: Basic Work Sheets (duplicating masters)	per teacher	(if needed)
Spanish: Tests (duplicating masters)	per teacher	(if needed)
Spanish: Problem Solving (duplicating masters)	per teacher	(if needed)
Basic Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Basic Work Sheets	per 2 teachers	
Enrichment Worksheets (duplicating masters)	per 2 teachers	
Teacher Edition - Enrichment Work Sheets	per 2 teachers	

Grade 5

Student Edition	per student	
Teacher Edition	per teacher	
Personalized Learning Packet (duplicating masters)	per teacher	
Copy Masters	per teacher	
Teacher Edition: Workbook - Problem Solving	per teacher	
Spanish: Parent Involvement (duplicating masters)	per teacher	(if needed)
Spanish: Basic Work Sheets (duplicating masters)	per teacher	(if needed)
Spanish: Tests (duplicating masters)	per teacher	(if needed)
Spanish: Problem Solving (duplicating masters)	per teacher	(if needed)
Basic Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Basic Work Sheets	per 2 teachers	
Enrichment Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Enrichment Work Sheets	per 2 teachers	

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D. C. Heath & Co., Heath Mathematics

Grade 6

Student Edition	per student	
Teacher Edition	per teacher	
Personalized Learning Packet (duplicating masters)	per teacher	
Copy Masters	per teacher	
Teacher Edition: Workbook - Problem Solving	per teacher	
Spanish: Parent Involvement (duplicating masters)	per teacher	(if needed)
Spanish: Basic Work Sheets (duplicating masters)	per teacher	(if needed)
Spanish: Tests (duplicating masters)	per teacher	(if needed)
Spanish: Problem Solving (duplicating masters)	per teacher	(if needed)
Basic Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Basic Work Sheets	per 2 teachers	
Enrichment Work Sheets (duplicating masters)	per 2 teachers	
Teacher Edition - Enrichement Work Sheets	per 2 teachers	

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Approved List of Pilot Materials

McGraw-Hill Book Co., McGraw-Hill Mathematics

Grade 7

Student Edition		per student
Teacher Edition	(Blackline Masters)	per teacher
Progress Tests		per teacher

Grade 8

Student Edition		per student
Teacher Edition	(Blackline Masters)	per teacher
Progress Tests		per teacher

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Scott, Foresman & Co., Scott, Foresman Mathematics

Grade K

Teacher Resource Book	per teacher	
Student Edition (Consumable)	per student	
Big Book (California Revision)	per teacher	
Teacher Edition - Big Book	per teacher	(if needed)
Teacher Edition - Spanish - Big Book	per teacher	

Grade 1

Teacher Resource Book	per teacher	
Student Edition (Consumable)	per student	
Teacher Edition	per teacher	(if needed)
Student Edition - Spanish (Consumable)	per student	(if needed)
Teacher Edition - Spanish	per teacher	
Workbook Answers	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	
Test Masters and Individual Record Form	per teacher	
Problem Solving Masters	per teacher	

Grade 2

Teacher Resource Book	per teacher	
Student Edition (Consumable)	per student	
Teacher Edition	per teacher	
Student Edition - Spanish (Consumable)	per student	(if needed)
Teachers Edition - Spanish	per teacher	
Workbook Answers - Practice Workbook	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	
Test Masters and Individual Record Form	per teacher	
Problem Solving Masters	per teacher	

Grade 3

Teacher Resource Book	per teacher	
Student Edition (Consumable)	per student	
Teacher Edition	per teacher	(if needed)
Student Edition - Spanish (Consumable)	per student	(if needed)
Teacher Edition - Spanish	per teacher	
Workbook Answers	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	
Test Masters and Individual Record Form	per teacher	
Problem Solving Masters	per teacher	

Grade 4

Teacher Resource Book	per teacher	
Student Edition	per student	
Teacher Edition	per teacher	(if needed)
Workbook Answers	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	

Scott, Foresman & Co., Scott, Foresman Mathematics

Grade 4

Test Masters and Individual Record Form	per teacher	
Problem Solving Masters	per teacher	

Grade 5

Teacher Resource Book	per teacher	
Student Edition	per student	
Teacher Edition	per teacher	(if needed)
Workbook Answers	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	
Test Masters and Individual Record Form	per teacher	
Problem Solving Masters	per teacher	

Grade 6

Teacher Resource Book	per teacher	
Student Edition	per student	
Teacher Edition	per teacher	(if needed)
Workbook Answers	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	
Test Masters and Individual Record Form	per teacher	
Problem Solving Masters	per teacher	

Grade 7

Teacher Resource Book	per teacher	
Student Edition	per student	
Teacher Edition	per teacher	(if needed)
Workbook Answers	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	
Test Masters and Individual Record Form	per teacher	
Problem Solving Masters		

Grade 8

Teacher Resource Book	per teacher	
Student Edition	per student	
Teacher Edition	per teacher	(if needed)
Workbook Answers	per teacher	
Reteaching Masters	per teacher	
Enrichment Masters	per teacher	
Test Masters and Individual Record Form	per teacher	
Problem Solving Masters	per teacher	

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District Math Program

Grade K

Student Work Sheets	per student	
Teachers Guide	per teacher	
Problem Solving Cards and Numeral Cards	per teacher	

Grade 1

Student Work Sheets	per student	
Teachers Guide - Basic Program	per teacher	
Advanced Student Book	per student	(as needed)
Teachers Guide - Advanced Program	per teacher	

Grade 2

Student Work Sheets	per student	
Teachers Guide - Basic Program	per teacher	
Advanced Student Book	per student	(as needed)
Teachers Guide - Advanced Program	per teacher	

Grade 3

Student Work Sheets	per student	
Student Booklets - Basic Program	per student	
Student Booklet - Answer Key	per teacher	
Teachers Guide - Basic Program	per teacher	
Advanced Student Book	per student	(as needed)
Teachers Guide - Advanced Program	per teacher	

Grade 4

Student Work Sheets	per student	
Student Booklets - Basic Program	per student	
Student Booklet - Answer Key	per teacher	
Teachers Guide - Basic Program	per teacher	
Advanced Student Book	per student	(as needed)
Teachers Guide - Advanced Program	per teacher	

Grade 5

Student Work Sheets	per student	
Student Booklets - Basic Program	per student	
Student Booklet - Answer Key	per teacher	
Teachers Guide - Basic Program	per teacher	
Advanced Student Book	per student	(as needed)
Teachers Guide - Advanced Program	per teacher	

Grade 6

Student Work Sheets	per student	
Student Booklets - Basic Program	per student	
Student Booklet - Answer Key	per teacher	
Teachers Guide - Basic Program	per teacher	
Advanced Student Book	per student	(as needed)
Teachers Guide - Advanced Program	per teacher	

Grade 7

Student Work Sheets	per student	
Student Booklets	per student	

Approved List of Pilot Materials

District Math Program

Grade 7

Student Booklets - Answer Keys	per teacher
Teachers Guide	per teacher

Grade 8

Student Work Sheets	per student
Student Booklets	per student
Student Booklets - Answer Keys	per teacher
Teachers Guide	per teacher

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APPENDIX F

CLASSROOM OBSERVATION FORM

SAN DIEGO UNI/IED SCHOOL DISTRICT

Classroom Observation

Mathematics Program Instruction

			Start	End
School: _____	Date: _____	Time:	_____	_____

Average daily time for math: _____

Teacher: _____ Observer: _____

Mathematics Program: (Publisher and Level) _____

Grade: _____ Exchange Students from another school: Yes _____ No _____ If YES enter number of students: _____

Spanish Material: Yes _____ No _____ Spanish Instruction: Yes _____ No _____

A. Classroom Snapshot

1. Grouping Pattern: (class size _____); # of large groups _____;

# of small groups _____; # children working individually _____

2. Number of Instructional Assistants Present:

Teachers _____; Student Teachers _____; Aides _____; Volunteers _____;

Peer Tutors _____

3a. Use of Teacher Time (% of time in various roles):

	Lecturing	Facilitating
Total class instruction	_____%	_____%
Large group	_____%	_____%
Small group	_____%	_____%
Individual	_____%	_____%
Preparation of materials, grading, collection and distribution of materials		_____%
Other _____ (Please specify, e.g., communication with aide, observer, etc.)		_____%

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3b. Use of other adult _____ time:
(Specify who)

	Lecturing	Facilitating
Total class instruction	_____%	_____%
Large group	_____%	_____%
Small group	_____%	_____%
Individual	_____%	_____%
Preparation of materials, grading, collection and distribution of materials		_____%
Other _____		_____%

B. Instructional Objective(s) of Lesson (please state):

_____

_____

C. Student Materials and Activities Used:

	Check if present	# of students involved	% of time most students involved
. Introduction of objective or daily lesson	_____	_____	_____
. Total group lectures & discussion of lesson	_____	_____	_____
. Small group instruction	_____	_____	_____
. Large group instruction	_____	_____	_____
. Individual instruction	_____	_____	_____
. Peer tutoring	_____	_____	_____
. Student text books (student booklet)	_____	_____	_____
. Manipulatives - (Big Book, kits, cubes, calculators, felt board, etc.)	_____	_____	_____
. "Warm-up" exercise	_____	_____	_____
. Daily "Mental Arithmetic" oral discussion (District Program)	_____	_____	_____
. Worksheet package (basic or initial worksheets)	_____	_____	_____

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	Check if present	# of students involved	% of time most students involved
. Basic worksheets			
. Practice worksheets			
. Re-teaching worksheets			
. Enrichment worksheets after mastery			
. Word problems, problem solving materials			
. Lab activities			
. Audio-visual materials			
. Pretests (readiness, placement) prior to instruction			
. Lesson tests			
. Unit (chapter, module) tests			
. Semester (end-of-book, cumulative) tests			
. Daily homework review			
. Fun & games at completion of module or unit			
. Others (please list):			
_____			
_____			
_____			
_____			

E. Other Materials Available in this Classroom (please list):

	From this program (check)	From another program (identify)

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F. Have the teacher explain her/his recordkeeping and management system for diagnosing and prescribing. (Note whether class record is posted (required by district).

G. Other Comments: (by teacher or aide)

H. What appears to be the general effect of the use of these materials in this classroom (create some confusion, contribute to a smoothly operating mathematics class, bore the students, increase enthusiasm, etc.)?

I. Overall summary, comments by observer (attempt to give an overall picture of manner in which program implemented.)

APPENDIX G

STAFF SURVEY INSTRUMENT

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Evaluation of Pilot Use of Math Programs

A. How would you rate the appropriateness of the math content for the following students?

	low			high	Not Applicable*
1. slow learning students	1	2	3	4	5
2. average learning students	1	2	3	4	5
3. fast learning students	1	2	3	4	5
4. learning disabled students	1	2	3	4	5
5. G.A.T.E. students	1	2	3	4	5
6. L.E.P. students	1	2	3	4	5

B. Was there adequate coverage for concept development in the following areas?

	low			high	Not Applicable*
7. warm-up	1	2	3	4	5
8. initial instructional material	1	2	3	4	5
9. daily assignments	1	2	3	4	5
10. drill and practice	1	2	3	4	5
11. problem solving	1	2	3	4	5
12. calculator material	1	2	3	4	5
13. computer material	1	2	3	4	5
14. career material	1	2	3	4	5
15. skill maintenance	1	2	3	4	5
16. assessing mastery	1	2	3	4	5
17. reteaching	1	2	3	4	5
18. enrichment/extension	1	2	3	4	5
19. reinforcement	1	2	3	4	5
20. homework	1	2	3	4	5

C. How would you rate the effectiveness of the material?

	low			high	Not Applicable*
21. warm-up	1	2	3	4	5
22. initial instructional material	1	2	3	4	5
23. daily assignment	1	2	3	4	5
24. drill and practice	1	2	3	4	5
25. problem solving	1	2	3	4	5
26. calculator material	1	2	3	4	5
27. computer material	1	2	3	4	5
28. career material	1	2	3	4	5
29. skill maintenance	1	2	3	4	5
30. assessing mastery	1	2	3	4	5
31. reteaching	1	2	3	4	5
32. enrichment/extension	1	2	3	4	5
33. reinforcement	1	2	3	4	5
34. homework	1	2	3	4	5

*N.A. = check if not applicable or unable to rate from your experience.

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D. How would you rate the program in relationship to the following?

		low			high	Not Applicable*
35.	survey test	1	2	3	4	5
36.	cumulative test (s)/ mid-year test (s)	1	2	3	4	5
37.	advanced concepts	1	2	3	4	5
38.	pacing	1	2	3	4	5
39.	sequence of material	1	2	3	4	5
40.	record keeping	1	2	3	4	5
41.	parent communication	1	2	3	4	5

E. To what extent did the inservice provided for the program assist you in:

		low			high	Not Applicable*
42.	pacing instruction	1	2	3	4	5
43.	reteaching	1	2	3	4	5
44.	enrichment	1	2	3	4	5
45.	applied problem solving	1	2	3	4	5
46.	assessing mastery	1	2	3	4	5
47.	recording student progress	1	2	3	4	5
48.	using materials	1	2	3	4	5
49.	overall	1	2	3	4	5

F. In a typical 5-day week, how many days per week was each of the following used for most of the students? If 0 days, omit the item.

		number of days				
50.	review	1	2	3	4	5
51.	warm-up drill	1	2	3	4	5
52.	concept development	1	2	3	4	5
53.	controlled practice (teacher monitors student work)	1	2	3	4	5
54.	seat work (extended uninterrupted practice)	1	2	3	4	5
55.	use of manipulatives for concept development	1	2	3	4	5
56.	homework	1	2	3	4	5
57.	problem solving	1	2	3	4	5
58.	advanced concept	1	2	3	4	5
59.	calculator/computer	1	2	3	4	5

C. Check which of the following services were regularly available to supplement your classroom mathematics instruction and rate the impact of each service used during the year.

	low			high	Not Applicable*
60. volunteer tutor	1	2	3	4	5
61. math laboratory	1	2	3	4	5
62. Basic Skills Supplementary Assistance	1	2	3	4	5
63. instructional aides	1	2	3	4	5
64. computer assisted instruction	1	2	3	4	5
65. on-site resource teacher	1	2	3	4	5

66. To what extent were you able to provide the full range of desirable instruction during the pilot of the math program?

very limited				very adequate
1	2	3	4	5

67. Were you using a different publisher's program prior to the pilot?

Yes	No
1	2

68. If so, how would you compare the pilot program with other math programs and materials you have used?

low			high	Not Applicable*
1	2	3	4	5

69. Would you recommend district adoption of this program?

Yes	No
1	2

PLEASE RESPOND TO QUESTIONS 70 and 71 IN THE OPEN SPACES ON THE ANSWER SHEET.

70. What advantages have you found with this program?

_____

_____

71. What disadvantages have you found with this program?

_____

_____

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APPENDIX H

STAFF RESPONSES TO INSERVICE AND SUPPORT SERVICES

TABLE H

Percent of Respondents from Elementary Schools
Selecting High Ratings for Inservice Questions on the Math Survey

Question Asked	Percent of Respondents Selecting High Ratings*			
	A-W	D	H	S-F
To what extent did the inservice provided for the program assist you in:				
. pacing instruction	53%	53%	41%	39%
. reteaching	47	51	38	38
. enrichment	70	50	49	37
. applied problem solving	64	50	44	39
. assessing mastery	71	63	53	47
. recording student progress	68	73	57	44
. using materials	75	68	63	56
. overall	68	63	60	54

* A 4-point rating scale was used. Ratings of 3 & 4 have been combined and interpreted as "high" ratings for this summary table.

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TABLE I

Percent of Respondents from Junior High Schools
Selecting High Ratings for Inservice Questions on the Math Survey

Question Asked	Percent of Respondents Selecting High Ratings*		
	D	McG-H	S-F
To what extent did the inservice provided for the program assist you in: . pacing instruction	58%	75%	20%
. reteaching	50	50	40
. enrichment	58	75	20
. applied problem solving	50	25	20
. assessing mastery	58	50	40
. recording student progress	50	25	40
. using materials	67	75	40
. overall	66	75	50
Median	58	63	40

* A 4-point rating scale was used. Ratings of 3 & 4 have been combined and interpreted as "high" ratings for this summary table.

TABLE J

Percent of Respondents from Elementary Schools
Selecting High Ratings for Services Indicated as Available to Them

Question Asked	Percent of Respondents Indicating Services Available and Selecting High Ratings*							
	Addison-Wesley		District		Heath		Scott, Foresman	
	Available	High Rating	Available	High Rating	Available	High Rating	Available	High Rating
Rate the impact of each of the following services if that service was regularly available to you.								
. volunteer tutor	48%	39%	47%	21%	55%	44%	55%	21%
. math laboratory	36	46	39	30	48	28	31	13
. Basic Skills Supplementary Assistance	69	69	67	67	76	64	69	56
. instructional aides	71	87	85	79	82	82	90	78
. computer assisted instruction	38	37	41	21	42	32	35	28
. on-site resource teacher	48	47	33	33	40	30	43	38

* In computing the percent of respondents giving "high" ratings (combined ratings of 3 and 4 on a 4-point scale), only the respondents rating the services were included. For example, in rating the impact of volunteer tutors, just 48% of the Addison-Wesley respondents indicated that this service was available. High ratings were given the tutors by 39% of this portion (the 48%) of the Addison-Wesley respondents.

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TABLE K

Percent of Respondents from Junior High Schools
Selecting High Ratings for Services Indicated as Available to Them

Question Asked	Percent of Respondents Indicating Services Available and Selecting High Ratings*					
	District		Mc-Graw-Hill		Scott, Foresman	
	Available	Rating	Available	Rating	Available	Rating
Rate the impact of each of the following services if that service was regularly available to you.						
. volunteer tutor	50%	0%	67%	50%	0%	0%
. math laboratory	45	60	0	0	0	0
. Basic Skills Supplementary Assistance	80	38	33	100	75	33
. instructional aides	73	100	67	100	75	0
. computer assisted instruction	45	20	33	100	0	0
. on-site resource teacher	73	75	0	0	0	0

Note: In interpreting these results, it is important to be aware of the small numbers of respondents for these programs:

District = 13
McGraw Hill = 5
Scott, Foresman = 5

*In computing the percent of respondents giving "high" ratings of 3 and 4 on a 4-point scale), only the respondents rating the services were included. For example, in rating the impact of volunteer tutors, just 67% of the McGraw-Hill respondents indicated that this service was available. High ratings were given the tutors by 50% of this portion (the 67%) of the McGraw-Hill respondents.

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APPENDIX I

PROGRAM COMPARISONS
OF ALL FACTORS
BASED ON EQUAL WEIGHTINGS

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Table A

Program Results
Based on Equal Weighting
Grade 3

Factor	Rank Sum Weight	Program Rank Points for Factor				Program Weighted Score			
		AW	D	H	SF	AW	D	H	SF
Stu. Ach. C/A	.125	1	3	4	2	.125	.375	.500	.250
Stu. Ach. Comp.	.125	2	1	4	3	.250	.125	.500	.375
Stu. Ach. Middle Grp.	.125*	2.5	2.5	2.5	2.5	.313	.313	.313	.313
Stu. Ach. Low Grp.	.125*	2.5	2.5	2.5	2.5	.313	.313	.313	.313
Stu. Ach. High Grp.	.125	1	2	4	3	.125	.250	.500	.375
Cost Per Gain	.125	1	4	2	3	.125	.500	.250	.375
Staff Opinion	.125	4	3	1.5	1.5	.500	.375	.188	.188
Least Cost	.125	2	4	3	1	.250	.500	.375	.125
TOTALS OF PROGRAM WEIGHTED SCORES:						2.001	2.751	2.939	2.314

*No statistically significant difference between programs. All programs given equal rank.

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Table B

Program Results
Based on Equal Weighting
Grade 6

Factor	Rank Sum Weight	Program Rank Points for Factor				Program Weighted Score			
		AW	D	H	SF	AW	D	H	SF
Stu. Ach. C/A	.125	2	4	1	3	.250	.500	.125	.375
Stu. Ach. Comp.	.125	2	4	1	3	.250	.500	.125	.375
Stu. Ach. Middle Grp.	.125	2	4	1	3	.250	.500	.125	.375
Stu. Ach. Low Grp.	.125*	2.5	2.5	2.5	2.5	.313	.313	.313	.313
Stu. Ach. High Grp.	.125	2	4	1	3	.250	.500	.125	.375
Cost Per Gain	.125	1	4	2.5	2.5	.125	.500	.313	.313
Staff Opinion	.125	1	4	2.5	2.5	.125	.500	.313	.313
Least Cost	.125	1	4	3	2	.125	.500	.375	.250
TOTALS OF PROGRAM WEIGHTED SCORES:						1.688	3.813	1.814	2.689

*No statistically significant difference between programs. All programs given equal rank.

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Table C

Program Results
Based on Equal Weighting
Grade 8

Factor	Rank Sum Weight	Program Rank Points for Factor			Program Weighted Score		
		D	McG-H	SF	D	McG-H	SF
Stu. Ach. C/A	.125	3	2	1	.375	.250	.125
Stu. Ach. Comp.	.125	2	2	2	.250	.250	.250
Stu. Ach. Middle Grp.	.125	2	2	2	.250	.250	.250
Stu. Ach. Low Grp.	.125	2	2	2	.250	.250	.250
Stu. Ach. High Grp.	.125	2	2	2	.250	.250	.250
Cost Per Gain	.125	3	2	1	.375	.250	.125
Staff Opinion	.125	2.5	1	2.5	.313	.125	.313
Least Cost	.125	3	2	1	.375	.250	.125
TOTALS OF PROGRAM WEIGHTED SCORES:					2.438	1.875	1.688